SEW EURODRIVE

MOVIDRIVE® *compact* MCH4_A

Edition

04/2002

Operating Instructions

1054 7916 / EN

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1 Important Notes

Safety and warning instructions

Always follow the safety and warning instructions contained in this publication!

Electrical hazard
Possible consequences: Severe or fatal injuries.

Hazard
Possible consequences: Severe or fatal injuries.

Hazardous situation
Possible consequences: Slight or minor injuries.

Harmful situation
Possible consequences: Damage to the unit and the environment.

Tips and useful information.

A requirement of fault-free operation and fulfillment of any rights to claim under guarantee is that you adhere to the information in the **operating instructions**. Consequently, **read the operating instructions** before you start working with the unit!

The **operating instructions** contain **important information about servicing**; as a result, they should be kept **in the vicinity of the unit**.

Designated use

MOVIDRIVE® *compact* drive inverters are intended for use in industrial and commercial systems for the operation of AC asynchronous motors or permanent-field AC synchronous motors. These motors must be suitable for operation with frequency inverters. No other loads may be connected to the units.

MOVIDRIVE® *compact* drive inverters are units intended for stationary installation in switch cabinets. Observe all instructions referring to the technical data and the permitted conditions where the unit is operated.

Do not start up the unit (take into operation in the designated fashion) until you have established that the machine complies with the EMC Directive 89/336/EEC and that the conformity of the end product has been determined in accordance with the Machinery Directive 89/392/EEC (with reference to EN 60204).

Application environment

The following uses are forbidden unless measures are expressly taken to make them possible:

- Use in explosion-proof areas
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, radiation, etc.
- Use in non-stationary applications which are subject to mechanical vibration and shock loads in excess of the requirement in EN 50178

Safety functions

MOVIDRIVE® *compact* drive inverters are not allowed to perform any safety functions unless the inverters are monitored by other safety systems.

Use superordinate safety systems to guarantee the protection of machinery and people.

Waste disposal

Please follow the current instructions: Dispose in accordance with the material structure and the regulations in force, for instance as:

- Electronics scrap (printed-circuit boards)
- Plastic (housing)
- Sheet metal
- Copper

etc.

2 Safety Notes

Installation and startup

- **Never install damaged products or take them into operation.** Please submit a complaint to the shipping company immediately in the event of damage.
- **Installation, startup and service work** may only be performed by **trained personnel** observing applicable accident prevention regulations and operating instructions! The regulations in force (e.g. EN 60204, VBG 4, DIN-VDE 0100/0113/0160) must also be complied with.
- Follow the **specific instructions** during **installation** and **startup** of the motor and the brake!

- Make sure that **preventive measures** and **protection devices** correspond to the **applicable regulations** (e.g. EN 60204 or EN 50178).

  Necessary protection measures: Grounding the unit

  Necessary protection device: Overcurrent protection devices
- **The unit meets all requirements for reliable isolation** of power and electronics connections in accordance with EN 50178. **All connected circuits** must also **satisfy the requirements for reliable isolation** so as to guarantee reliable isolation.
- Take **suitable measures** to ensure that the connected **motor does not start up automatically when the** inverter **is switched on**.

  Suitable measures are:
  - With MCF/MCV/MCS4_A: Connect terminal X10:9 '/CONTROL. INHIBIT' to DGND.
  - With MCH4_A: Disconnect the electronics terminal block X11.

Operation and service

- **Disconnect the unit from the power supply system** prior to **removing the protective cover. Dangerous voltages** may still be present for up to **10 minutes after mains disconnection**.

- The unit has **IP 00** enclosure with the **protective cover removed**. **Dangerous voltages** are present at all subassemblies except for the control electronics. The unit must be closed during operation.
- **Dangerous voltages** are present at the **output terminals** and the **cables and motor terminals connected to them when the unit is switched on**. This also applies even when the unit is inhibited and the motor at a standstill.
- Just because the **operation LED and other display elements** have gone out **does not mean** that the unit has been disconnected from the supply system and is **de-energized**.

- **Safety functions inside the unit** or a **mechanical blockage** may cause the **motor to stop**. The **removal of the source of the malfunction** or a **reset** can result in an **automatic restart of the drive**. If, for safety reasons, this is **not permitted** for the driven machine, the **unit must be disconnected from the supply system** before correcting the fault. In such cases, it is also forbidden for the **'Auto reset' function (P841)** to be activated.
- Switch the inverter output only **when the output stage is inhibited**.

3 Unit Design

3.1 Unit designation, nameplates and scope of delivery

Sample unit designation

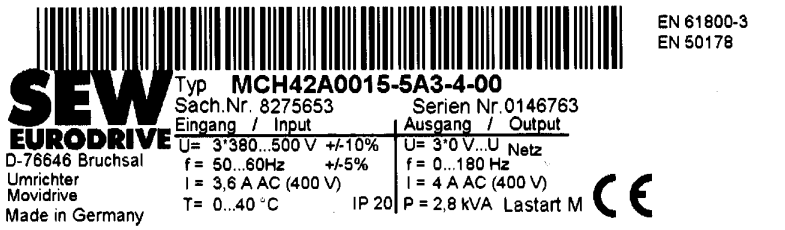
MOVIDRIVE® *compact* MCH 41 A 0055-5A3-4-00

- Version — 00 = Standard / 0T = Technology
- Quadrants — 4 = 4Q (with brake chopper)
- Type of supply — 3 = 3-phase
- Input filter — A = installed / 0 = not installed
- Rated supply voltage — 5 = 380...500 V_{AC} / 2 = 200...240 V_{AC}
- Recommended motor power — 0055 = 5.5 kW
- Version A
- Type series: 40 = without fieldbus, 41 = with PROFIBUS-DP, 42 = with INTERBUS FO
- Type: MDH = flux control mode with Hiperface encoder for asynchronous motors and synchronous motors

05148AEN

Sample nameplate

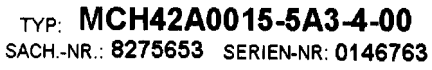
The overall nameplate is attached to the side of the unit.



05230AXX

Figure 1: Overall nameplate

Furthermore, a type label is attached to the front of the control unit (above the TERMINAL option slot).



05231AXX

Figure 2: Type label

Scope of delivery

- Connector housing for signal terminals (X10...X12), connected.
- In addition, with size 1: Plug housing for the power terminals (X1...X4), connected.
- In addition, with sizes 1 and 2: Power shield clamp.
- In addition, with sizes 4 and 5: Touch guard for the power terminals.

3.2 Unit design MCH4_A

Size 1 MCH4_A...-5A3 (400/500 V units): 0015...0040

MCH4_A...-2A3 (230 V units): 0015...0037

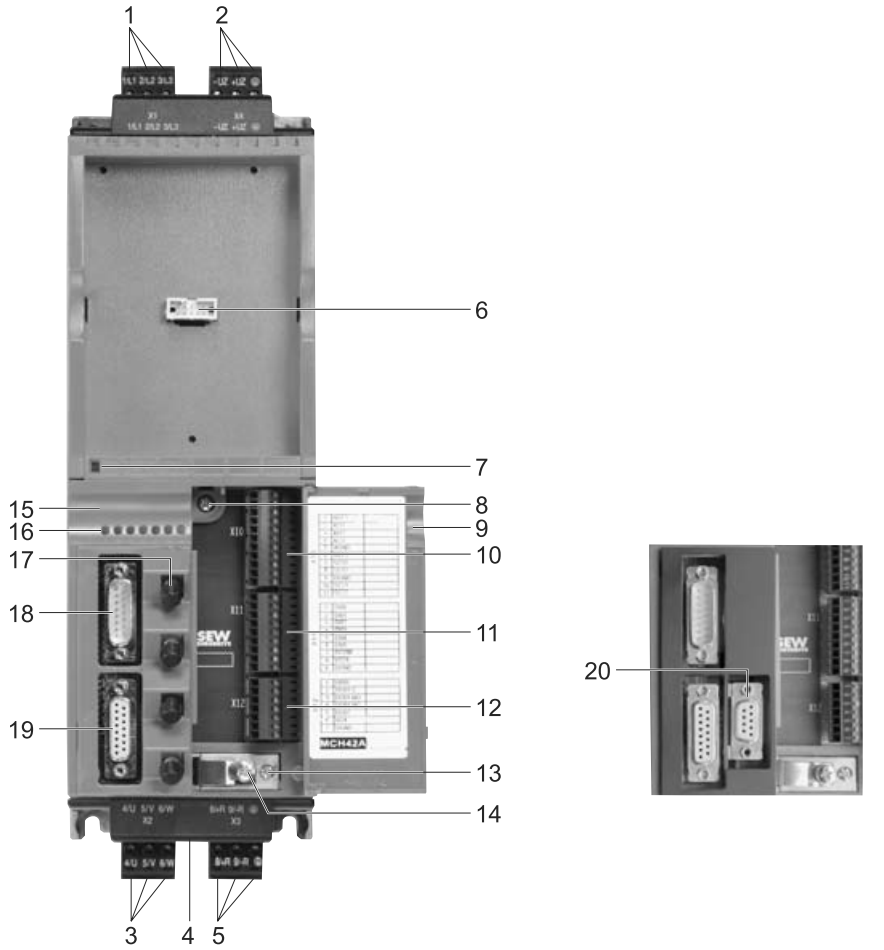


Figure 3: Unit design, MOVIDRIVE® compact MCH4_A, size 1

1. X1: Mains connection L1 (1) / L2 (2) / L3 (3), separable
2. X4: DC link connection $-U_Z$ / $+U_Z$ and PE connection, separable
3. X2: Motor connection U (4) / V (5) / W (6), separable
4. Connection for power shield clamp (not visible)
5. X3: Braking resistor connection R+ (8) / R- (9) and PE connection, separable
6. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
7. V1: Operation LED
8. Retaining screw A for terminal unit
9. Flap on terminal unit with labeling tile
10. X10: Electronics terminal strip, separable
11. X11: Electronics terminal strip, separable
12. X12: Electronics terminal strip, separable
13. Retaining screw B for terminal unit
14. Screw for electronics shield clamp
15. Terminal unit, removable
16. Diagnostic LEDs INTERBUS-FO
17. Only with MCH42A X30...X33: INTERBUS-FO connections
18. X14: Incremental encoder simulation output or external encoder input (15-pin sub D plug)
19. X15: Motor encoder input (15-pin sub D socket)
20. Only with MCH41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 2

MCH4_A...-5A3 (400/500 V units): 0055...0110

MCH4_A...-2A3 (230 V units): 0055 / 0075

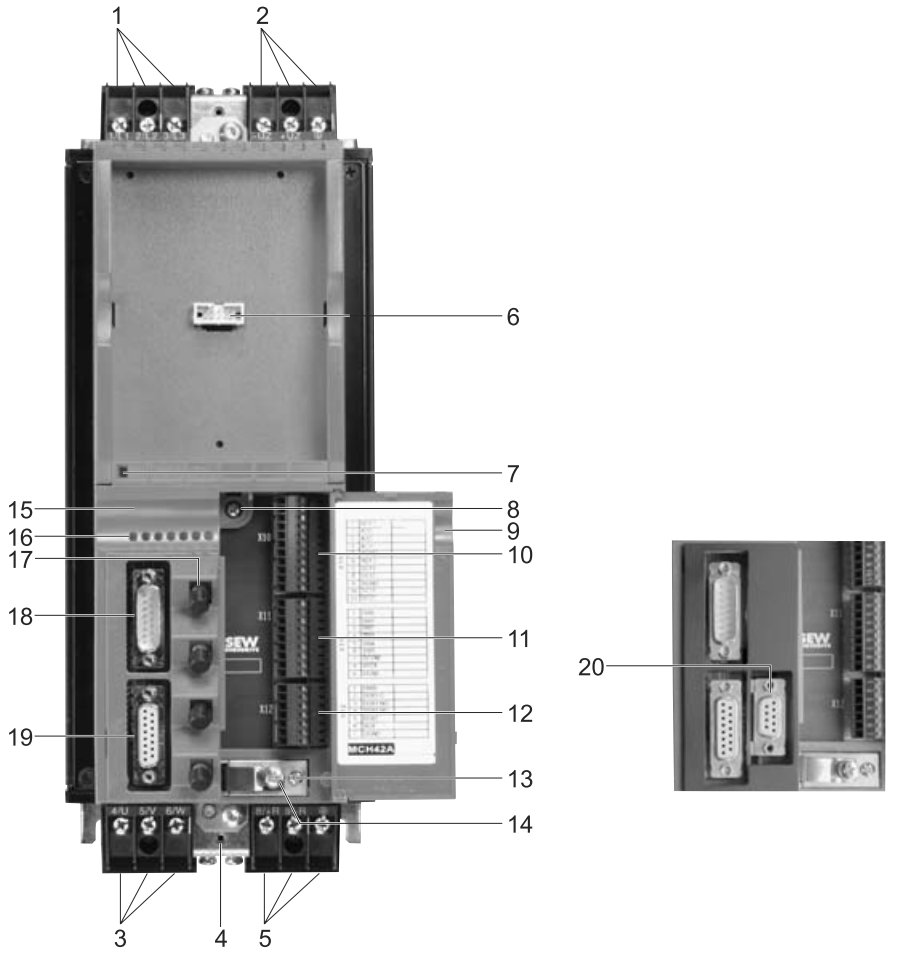


Figure 4: Unit design, MOVIDRIVE® compact MCH4_A, size 2

1. X1: Mains connection L1 (1) / L2 (2) / L3 (3)
2. X4: DC link connection $-U_Z$ / $+U_Z$ and PE connection
3. X2: Motor connection U (4) / V (5) / W (6)
4. X6: Connection for power shield clamp (not visible)
5. X3: Braking resistor connection R+ (8) / R- (9) and PE connection
6. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
7. V1: Operation LED
8. Retaining screw A for terminal unit
9. Flap on terminal unit with labeling tile
10. X10: Electronics terminal strip, separable
11. X11: Electronics terminal strip, separable
12. X12: Electronics terminal strip, separable
13. Retaining screw B for terminal unit
14. Screw for electronics shield clamp
15. Terminal unit, removable
16. Diagnostic LEDs INTERBUS-FO
17. Only with MCH42A X30...X33: INTERBUS-FO connections
18. X14: Incremental encoder simulation output or external encoder input (15-pin sub D plug)
19. X15: Motor encoder input (15-pin sub D socket)
20. Only with MCH41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 3

MCH4_A...-503 (400/500 V units): 0150...0300
MCH4_A...-203 (230 V units): 0110 / 0150

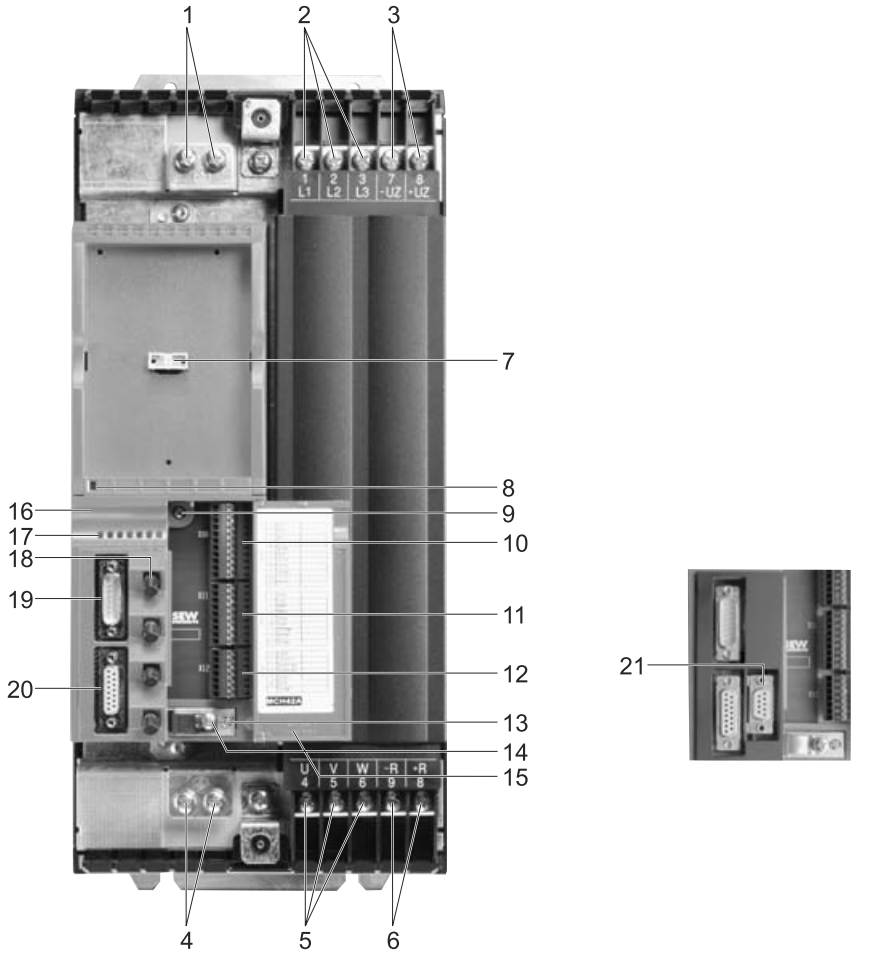


Figure 5: Unit design, MOVIDRIVE® compact MCH4_A, size 3

1. PE connections
2. X1: Mains connection L1 (1) / L2 (2) / L3 (3)
3. X4: DC link connection $-U_Z$ / $+U_Z$
4. PE connections
5. X2: Motor connection U (4) / V (5) / W (6)
6. X3: Braking resistor connection R+ (8) / R- (9)
7. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
8. V1: Operation LED
9. Retaining screw A for terminal unit
10. X10: Electronics terminal strip, separable
11. X11: Electronics terminal strip, separable
12. X12: Electronics terminal strip, separable
13. Retaining screw B for terminal unit
14. Screw for electronics shield clamp
15. Flap on terminal unit with labeling tile
16. Terminal unit, removable
17. Diagnostic LEDs INTERBUS-FO
18. Only with MCH42A X30...X33: INTERBUS-FO connections
19. X14: Incremental encoder simulation output or external encoder input (15-pin sub D plug)
20. X15: Motor encoder input (15-pin sub D socket)
21. Only with MCH41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 4

MCH4_A...-503 (400/500 V units): 0370 / 0450

MCH4_A...-203 (230 V units): 0220 / 0300

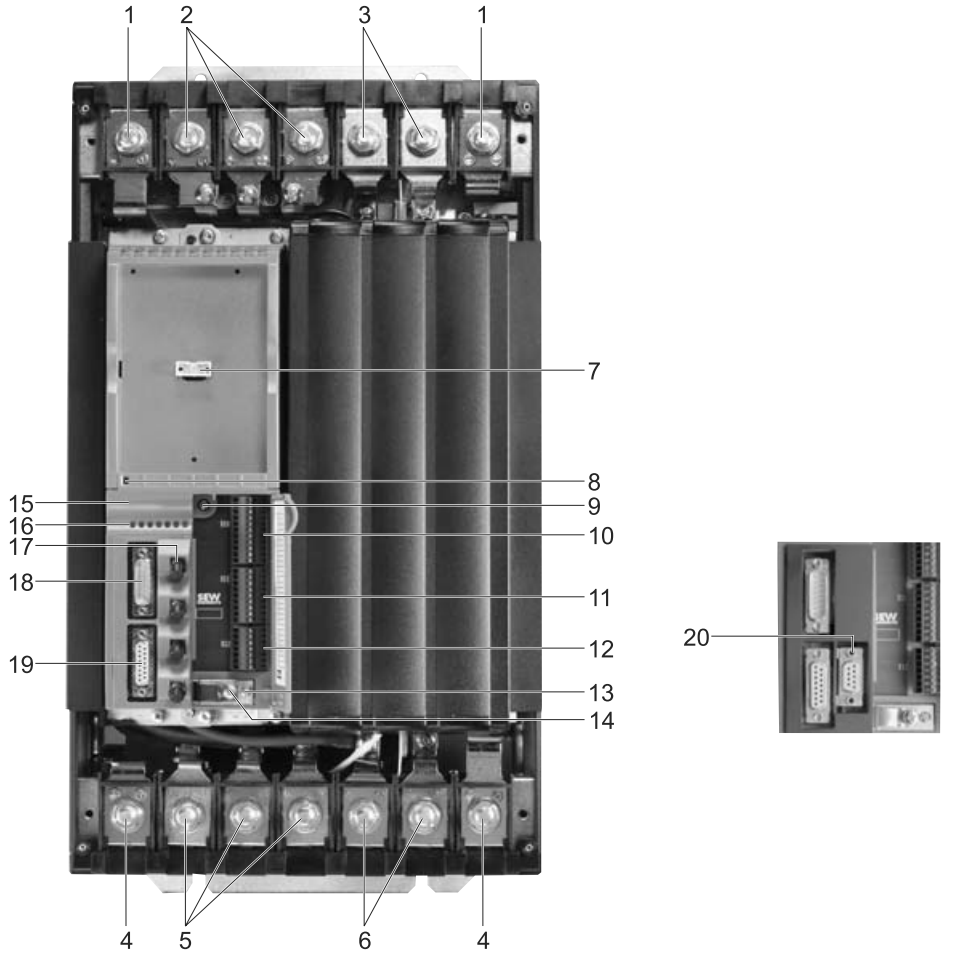


Figure 6: Unit design, MOVIDRIVE® compact MCH4_A, size 4

1. PE connections
2. X1: Mains connection L1 (1) / L2 (2) / L3 (3)
3. X4: DC link connection $-U_Z$ / $+U_Z$
4. PE connections
5. X2: Motor connection U (4) / V (5) / W (6)
6. X3: Braking resistor connection R+ (8) / R- (9)
7. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
8. V1: Operation LED
9. Retaining screw A for terminal unit
10. X10: Electronics terminal strip, separable
11. X11: Electronics terminal strip, separable
12. X12: Electronics terminal strip, separable
13. Retaining screw B for terminal unit
14. Screw for electronics shield clamp
15. Terminal unit, removable
16. Diagnostic LEDs INTERBUS-FO
17. Only with MCH42A X30...X33: INTERBUS-FO connections
18. X14: Incremental encoder simulation output or external encoder input (15-pin sub D plug)
19. X15: Motor encoder input (15-pin sub D socket)
20. Only with MCH41A X30: PROFIBUS-DP connection (9-pin sub D socket)

Size 5 MCH4_A...-503 (400/500 V units): 0550 / 0750

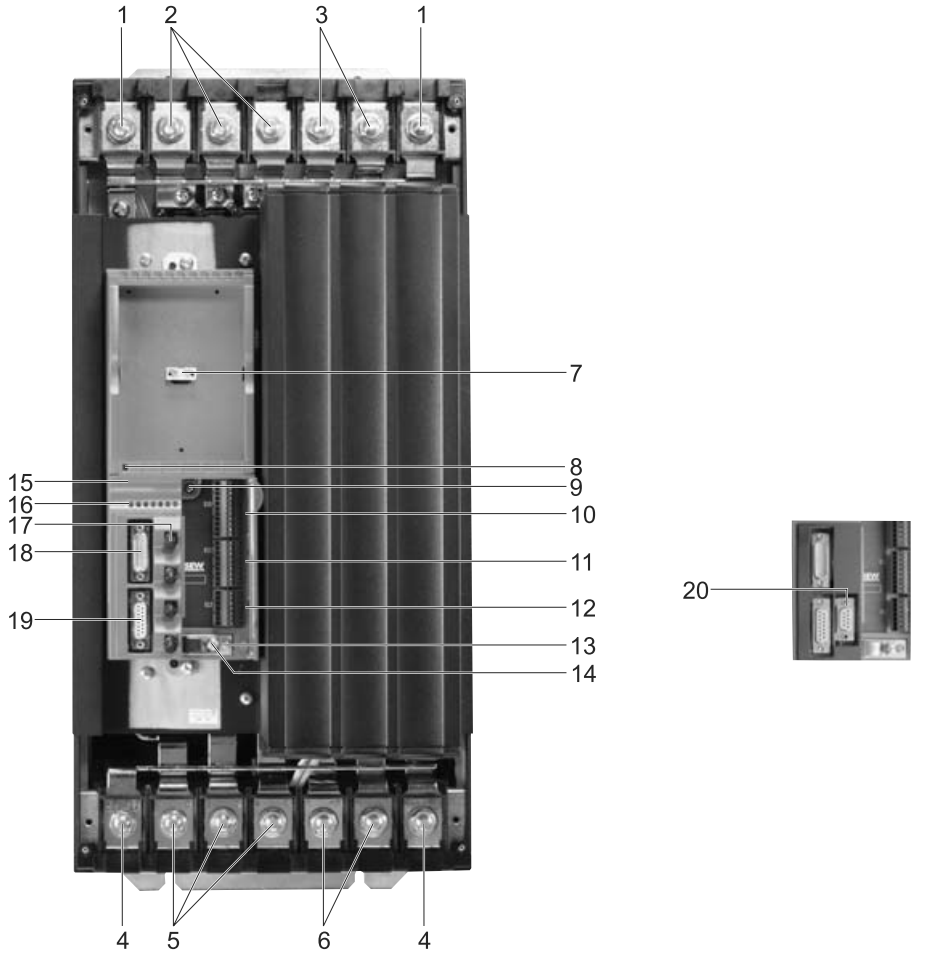


Figure 7: Unit design, MOVIDRIVE® compact MCH4_A, size 5

1. PE connections
2. X1: Mains connection L1 (1) / L2 (2) / L3 (3)
3. X4: DC link connection $-U_Z$ / $+U_Z$
4. PE connections
5. X2: Motor connection U (4) / V (5) / W (6)
6. X3: Braking resistor connection R+ (8) / R- (9)
7. TERMINAL: Option slot for DBG11B keypad or USS21A serial interface
8. V1: Operation LED
9. Retaining screw A for terminal unit
10. X10: Electronics terminal strip, separable
11. X11: Electronics terminal strip, separable
12. X12: Electronics terminal strip, separable
13. Retaining screw B for terminal unit
14. Screw for electronics shield clamp
15. Terminal unit, removable
16. Diagnostic LEDs INTERBUS-FO
17. Only with MCH42A X30...X33: INTERBUS-FO connections
18. X14: Incremental encoder simulation output or external encoder input (15-pin sub D plug)
19. X15: Motor encoder input (15-pin sub D socket)
20. Only with MCH41A X30: PROFIBUS-DP connection (9-pin sub D socket)

4 Installation

4.1 Installation instructions for basic unit

It is essential to comply with the safety notes during installation!

Tightening torques

- Only use **genuine connection elements**. Note the **permitted tightening torques** of MOVIDRIVE® power terminals.
  - Size 1 → 0.6 Nm (5.3 lb.in)
  - Size 2 → 1.5 Nm (13.3 lb.in)
  - Size 3 → 3.5 Nm (31 lb.in)
  - Sizes 4 and 5 → 14 Nm (124 lb.in)

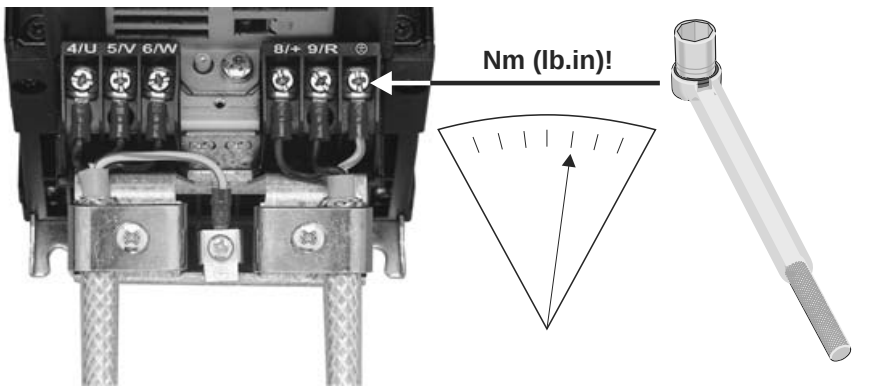


Figure 8: Note the tightening torques

Minimum clearance and mounting position

- Leave **100 mm (4 in) clearance at the top and bottom** for optimum cooling. No lateral clearance required; the units can be lined up side-by-side. With sizes 4 and 5, do not install any components which are sensitive to high temperatures within 300 mm (11.81 in) of the top of the unit. Only install the units **vertically**. Do not install the units horizontally, tilted or upside down.

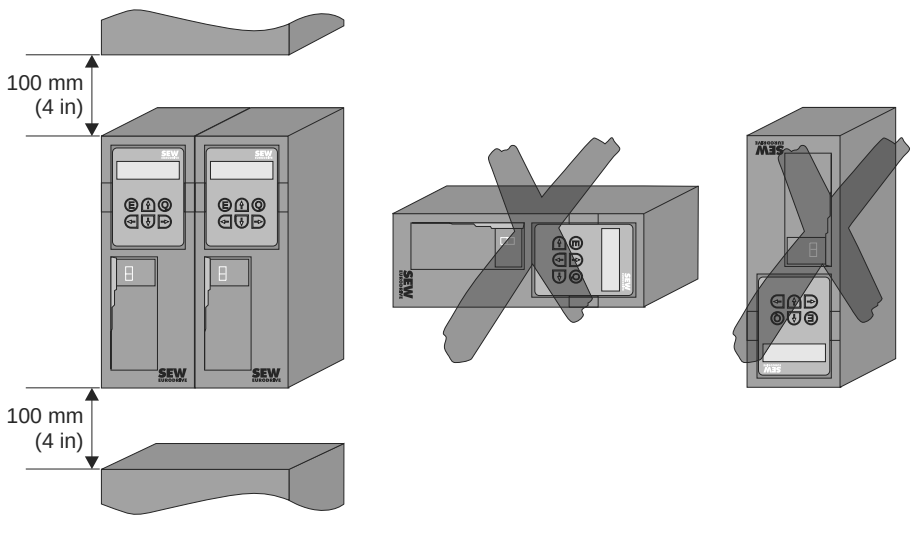


Figure 9: Minimum clearance and installation position of the units

Separate cable ducts

- Route **power cables** and **electronics cables** in **separate cable ducts**.

Input fuses and earth-leakage circuit breakers

- Install the **input fuses at the beginning of the supply system lead** after the supply bus junction (→ Wiring diagram for basic unit, power section and brake).
- Using an **earth-leakage circuit breaker** as **the sole protection device** is **not permitted**. **Earth-leakage currents > 3.5 mA** can arise during normal operation of the inverter. Use universal current-sensitive earth-leakage circuit breakers only.

Supply system and brake contactors

- **Use only contactors in utilization category AC-3** (IEC 158-1) as supply system and brake contactors.

More than four units

- With **more than four units** on a **supply system contactor** designed to cope with the total current: **Insert a 3-phase line choke in the circuit** to limit the inrush current.

PE mains connection (→ EN 50178)

- With a **supply system lead < 10 mm² (AWG 8)**: Lay a **second PE conductor with the cross section of the supply system lead** in parallel to the protective earth via separate terminals or use a **copper protective earth with a cross section of 10 mm² (AWG 8)**.
- With a **supply system lead ≥ 10 mm² (AWG 8)**: Lay a **copper protective earth with the cross section of the supply system lead**.

IT systems

- SEW recommends using **earth-leakage monitors with a pulse code measuring process** in voltage supply systems with a non-earthed star point **(IT systems)**. This avoids mis-tripping of the earth-leakage monitor due to the earth capacitance of the inverter.

Cross sections

- Supply system lead: **Cross section according to rated input current I_{mains}** at rated load.
- Motor lead: **Cross section according to rated output current I_N**.
- Electronics cables:

MCF/MCV/MCS:	Single core 0.20...2.5 mm² (AWG24...12)
	Double core 0.20...1 mm² (AWG24...17)
MCH:	Only single core 0.20...1.5 mm² (AWG24...16)
	Use right-angled crimping pliers with 1.5 mm² (AWG16)

Unit output

- **Connect ohmic/inductive loads (motors) only.** Never connect capacitive loads!

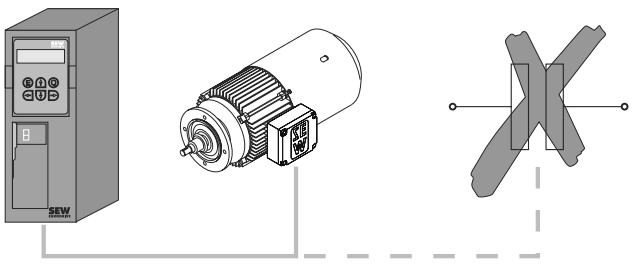


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Figure 10: Connect ohmic/inductive loads only; do not connect capacitive loads

Connecting braking resistors

- Use **two closely twisted cables or a 2-core shielded power cable**. Cross section according to the rated output current of the inverter.
- Protect the braking resistor with a **bimetallic relay / thermal overload relay** (→ Wiring diagram for basic unit, power section and brake). Set the **trip current** according to the **technical data of the braking resistor**.

Operating braking resistors

- The connection leads to the braking resistors carry a **high DC voltage (approx. 900 V)** during rated operation.
- The **surfaces** of the braking resistors get **very hot when the braking resistors are loaded with P_N**. Select a **suitable installation position**. As a rule, braking resistors are mounted on the switch cabinet roof.
- Install the **flat-type braking resistors** together with the appropriate **touch guard**.

Binary inputs / binary outputs

- The **binary inputs** are **electrically isolated** by optocouplers.
- The **binary outputs** are **short-circuit proof**, although they are **not interference-voltage-proof** (exception: relay output DOØ1). External voltage can cause irreparable damage to the binary outputs.

Shielding and earthing

- Use **shielded control cables** only.
- Connect the **shield by the shortest possible route and make sure it is earthed over a wide area at both ends**. You can ground one end of the shield via a suppression capacitor (220 nF / 50 V) to avoid ground loops. If using double-shielded cables, ground the outer shield on the inverter end and the inner shield on the other end.

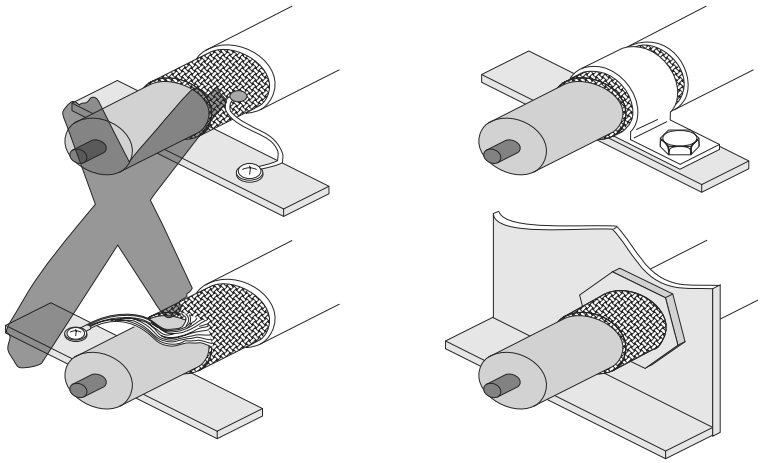

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Figure 11: Example of correct shield connection with metal clamp (shield clamp) or metal cable gland

- **Shielding** can also be achieved by laying the cables in **grounded sheet metal ducts or metal pipes**. In this case, the **power cables and control cables** should be **laid separately**.
- Provide **high frequency compatible grounding** for the **inverter** and **all additional units** (wide area metal-on-metal contact between the unit housing and ground, e.g. unpainted switch cabinet mounting panel).

Line filter

- **Sizes 1 and 2** are fitted with an **line filter as standard**. This line filter ensures that **limit value class A is maintained on the supply side**. Use an NF...-... line filter as an option to maintain the class B limit.
- The **NF...-... line filter option** is required for **sizes 3 to 5** to maintain class A and B limits.
- Install the **line filter close to the inverter**, but outside the minimum clearance required for cooling.
- Restrict the **cable between the line filter and the inverter to the absolute minimum length required**, and never more than 400 mm (15.8 in). Unshielded, twisted cables are sufficient. Also use unshielded cables as the supply system lead.
- This line filter must be installed either **directly at the entry point into the switch cabinet or in the immediate vicinity of the inverter** if **several inverters are connected to the same line filter**. The line filter must be chosen on the basis of the total current of the connected inverters.
- **No EMC limits are specified for interference emission** in **voltage supply systems without an earthed star point** (IT systems). The **effectiveness of line filters** in IT systems is **severely limited**.

Interference emission

SEW recommends the following **EMC measures on the output side to maintain the class A and B limits**:

- Shielded motor feeder
- HD... output choke option

HD... output choke

- Install the **output choke close to the inverter**, but outside the minimum clearance required for cooling.
- Route **all three phases together through the output choke**. **Do not route the PE conductor through the output choke!**

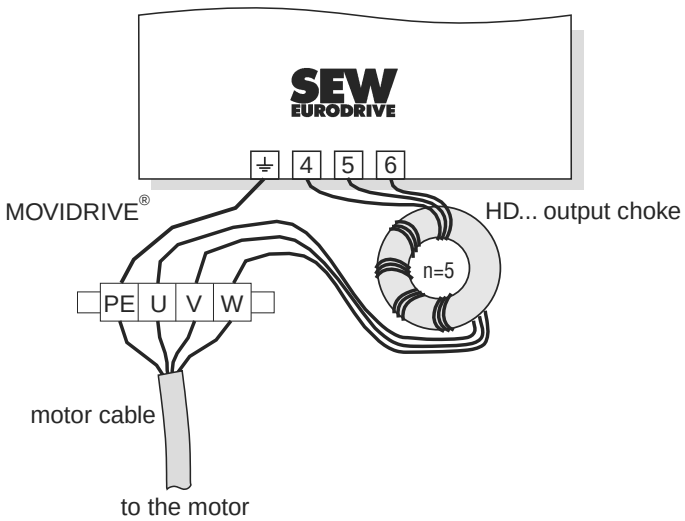

Figure 12: Connecting HD... output chokes

4.2 Installation instructions for PROFIBUS-DP interface (MCH41A)

Pin assignment

Connection to the PROFIBUS network using a 9-pin sub D plug according to IEC 61158. The T-bus connection must be made using a plug with the corresponding configuration.

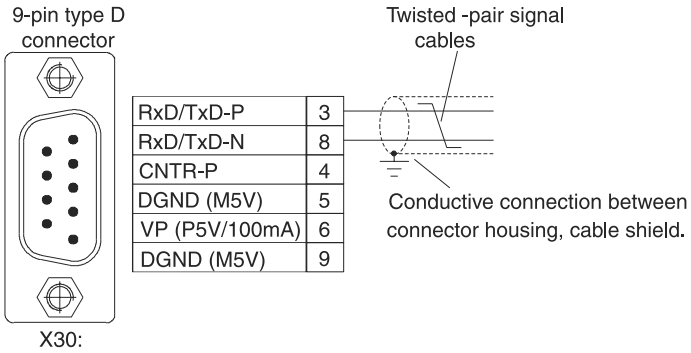

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Figure 13: Assignment of 9-pin sub D plug to IEC 61158

As a rule, the MOVIDRIVE® *compact* drive inverter is connected to the PROFIBUS system using a shielded twisted-pair cable. Note the maximum supported transmission rate when you are selecting the bus connector.

The two-core cable is connected to the PROFIBUS connector using pin 3 (RxD/TxD-P) and pin 8 (RxD/TxD-N). Communication takes place via these two contacts. The RS-485 signals RxD/TxD-P and RxD/TxD-N must be connected to the same contacts in all PROFIBUS stations. Otherwise, communication via the bus will not function.

The PROFIBUS interface sends a TTL control signal via pin 4 (CNTR-P) for a repeater or FO adapter (reference = pin 9).

Shielding and routing bus cables

The PROFIBUS interface supports RS-485 transmission technology and requires the cable type A to IEC 61158 specified as the physical medium for PROFIBUS. This cable must be a shielded, twisted-pair two-core cable.

Having the bus cable correctly shielded cuts out parasitic interference which can occur in an industrial environment. The following measures enable the best possible shielding to be achieved:

- Tighten the retaining screws of plugs, modules and equipotential bonding conductors until finger-tight.
- Only use connectors with a metal housing or a metallized housing.
- Connect the shield in the connector over a large surface area.
- Apply the bus cable shielding on both ends.
- Do not route the signal and bus cables in parallel to the power cables (motor feeders); use separate cable ducts if at all possible.
- Only use metal, grounded cable racks in industrial environments.
- Join the signal cables and the associated equipotential bonding together at closely spaced intervals by the shortest route.
- Avoid using plug connections to extend bus cables.
- Route the bus cables closely adjacent to available grounding surfaces.

In the event of fluctuations in the ground potential, a compensating current may flow along the shield which is connected at both ends and to the ground potential (PE). In this case, make adequate provision for equipotential bonding in accordance with the relevant VDE regulations.

Bus termination with MCH41A

MCH41A is not provided with bus terminating resistors so that the bus system can be taken into operation more easily and in order to reduce the number of error sources.

Use a plug with an integrated bus terminating resistor if the inverter is at the start or finish of a PROFIBUS segment and only one PROFIBUS cable is leading to the inverter.

Switch on the bus terminating resistors on this PROFIBUS plug.

Setting the station address with MCH41A

The PROFIBUS station address is set using DIP switches 1...8 (valency 2^0...2^6) below the connection unit (→ Sec. 'Removing the connection unit' on page 32). MOVIDRIVE® *compact* supports the address range 0...125.

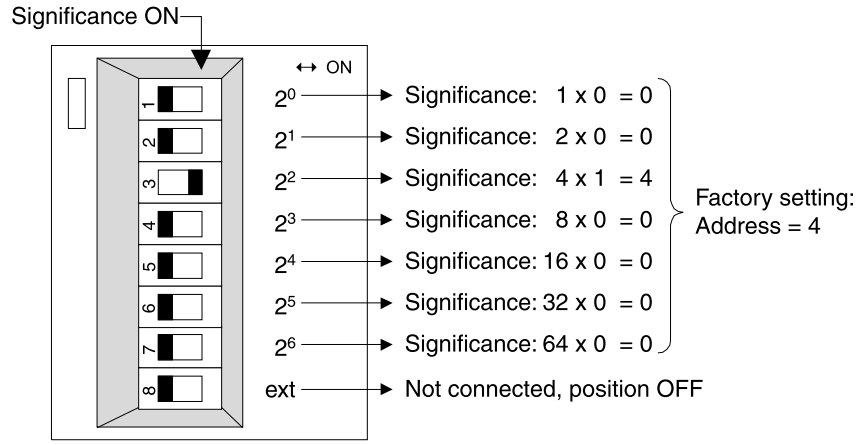

Figure 14: Setting the PROFIBUS station address with MCH41A

The PROFIBUS station address can only be set using the DIP switches when the connection unit has been removed. This means the address cannot be altered during ongoing operation. The change comes into effect when the drive inverter is switched back on (power system + 24 V OFF/ON). The drive inverter displays the current station address in fieldbus monitor parameter P092 'Fieldbus address' (display with DBG11B or MOVITOOLS/SHELL).

For example: Setting station address 17

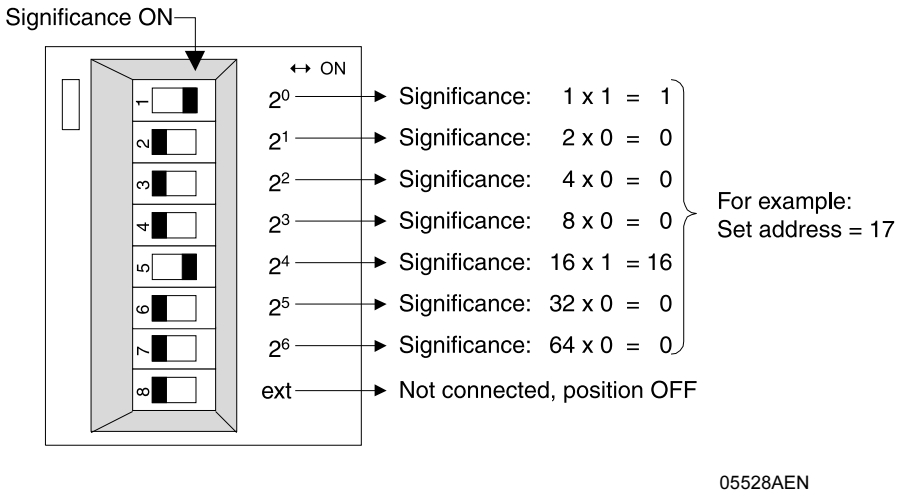

Figure 15: Setting station address 17

4.3 Installation instructions for INTERBUS FO interface (MCH42A)

Bus connection via fiber optic cable (FO)

The bus connection uses fiber optic cables. You can use either polymer fiber cables or HCS cables.

Polymer fiber cables

This type of cable is used for distances of up to 70 meters between two INTERBUS stations. Various types are available depending on the application. This cable type offers straightforward and inexpensive installation.

HCS cables

This type of cable can be used over distances of up to 500 m, since it has much lower light attenuation values than polymer fiber cable.

The bus cable must be at least 1 meter long. Cable bridges from Phoenix Contact must be used for shorter distances.

Please refer to Phoenix Contact's fiber optic cable installation guidelines (art. name IBS SYS FOC ASSEMBLY) for further information about the correct routing of fiber optic cables.

Checklist for installing FO cables

Routing FO cables

- Do not exceed the maximum cable length
- Note the permitted bending radii
- Do not crush or kink FO cables
- Do not exceed the strain limit when routing
- When unreeling FO cables for installation, always use an unreeling fixture

Protective measures for FO cables

- Protect them from strain and impermissibly small bending radii
- Route them without loops
- Protect them against sharp edges
- Use a special cable type when routing in special areas (e.g. laying underground or in proximity to welding robots)

Pre-fabricating FO cables

- Strip the insulation off the outer sheath and the individual cores without damaging them
- Fix the individual core in the plug (strain relief)
- Polish and install the end of the plug in accordance with the guidelines

Calibrating FO cables

- Check the light intensity complies with the limit values (optical diagnosis with CMD tool or FO measuring instrument)

Connecting FO plugs

The fiber optic cable is connected to MOVIDRIVE® *compact* MCH42A using plugs called F-SMA plugs. You need a pair of plugs for the incoming and outgoing remote bus (transmitter and receiver). SEW recommends using F-SMA plugs with an anti-kinking sleeve to ensure that the optimum bending radius is maintained.

Order data

for F-SMA plugs (e.g. Phoenix Contact)

Article name	Name
F-SMA plug set for polymer fiber cables (4 pieces) with anti-kinking sleeve	PSM-SET-FSMA/4-KT

Pin assignment

for INTERBUS remote bus with FO

Connection	Signal	Direction	FO core color
X30	FO remote IN (incoming remote bus)	Receive data	Orange (OG)
X31		Send data	Black (BK)
X32	FO remote OUT (continuing remote bus)	Receive data	Black (BK)
X33		Send data	Orange (OG)

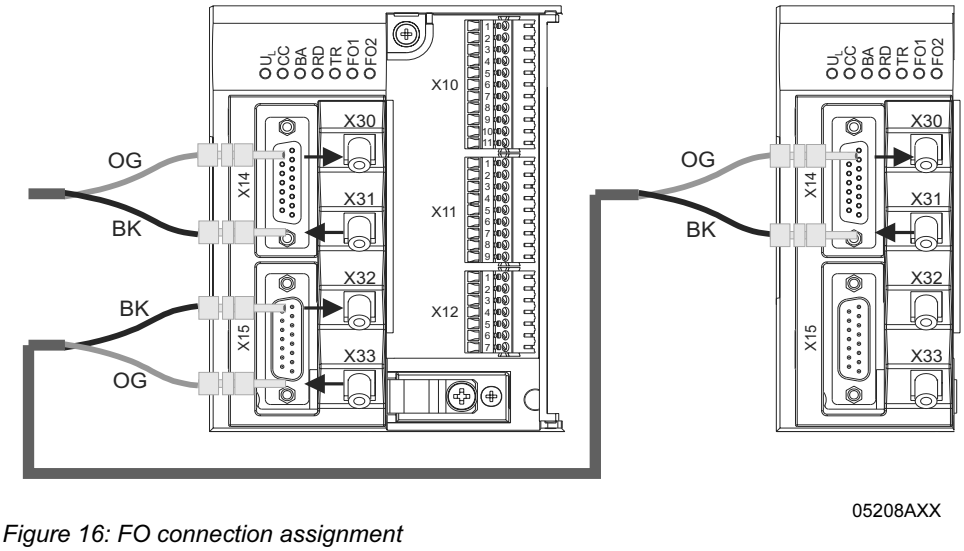

Figure 16: FO connection assignment

Length of the fiber optic cable

Use fiber optic cables with different lengths so as to avoid impermissible bending radii in the fiber optic cables. Refer to the length data in the figure below in this regard.

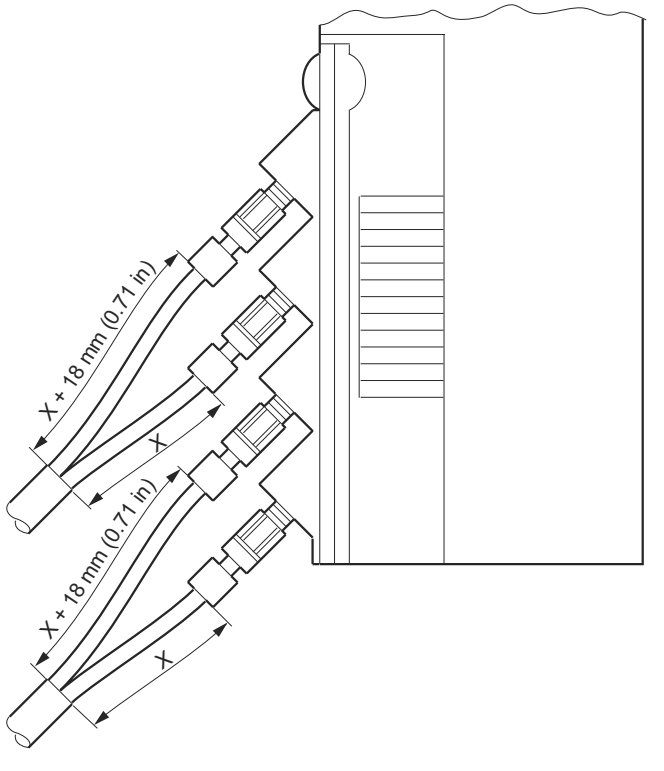

Figure 17: Different lengths of fiber optic cables

Setting the DIP switches

The six DIP switches S1 to S6 on the underside of the connection unit are used for setting the process data length, the PCP length and for selecting the baud rate.

STOP

The DIP switches can only be accessed when the connection unit has been removed (→ Sec. 'Removing the connection unit' on page 32). Switch off the supply system and the 24 V_{DC} backup voltage before you remove the connection unit. This means the settings of the DIP switches cannot be changed during ongoing operation.

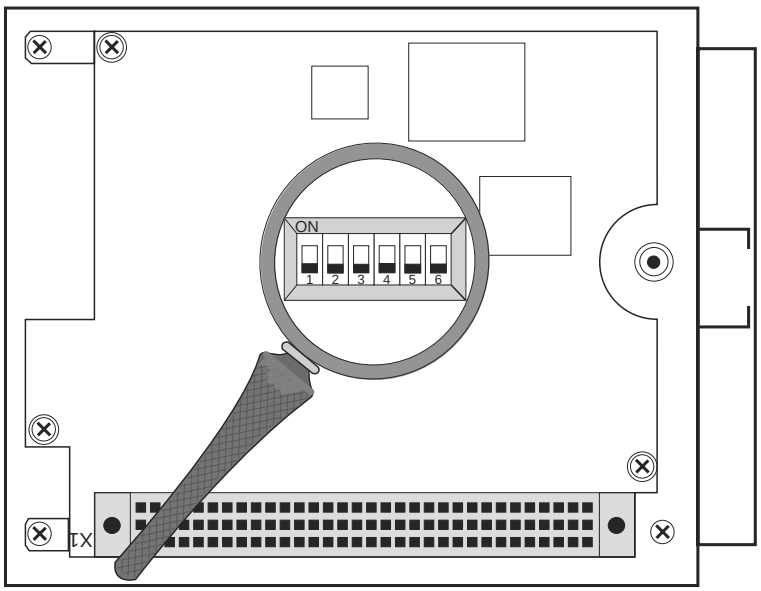

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Figure 18: DIP switches S1...S6 on the underside of the connection unit

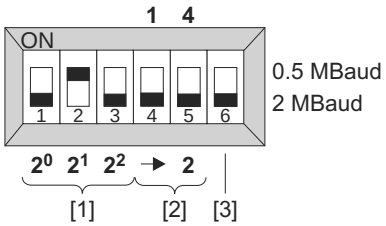

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Figure 19: Assignment of DIP switches S1...S6

[1] Number of process data items (1...6 PD), for example 2 PD
[2] Number of PCP words (1, 2 or 4), for example 2 PCP words
[3] Baud rate (ON = 0.5 Mbaud, OFF = 2 Mbaud), for example 2 Mbaud

The drive inverter signals the 'Microprocessor not ready' ID code (38 hex) if the DIP switch settings are not correct.

Setting the process data and PCP lengths

Up to six INTERBUS data words can be exchanged between the INTERBUS interface and the inverter. These data words can be split between the process data channel and the PCP channel using DIP switches S1 to S5. Because of the restriction to six data words, there are some settings which cannot be reproduced on the INTERBUS.

The inverter signals the 'Microprocessor not ready' IC code (38hex) if the setting is incorrect. Its red TR LED indicates that the setting is incorrect. The following figure shows the peripheral conditions for setting the process data and PCP lengths. The following limits apply in principle:

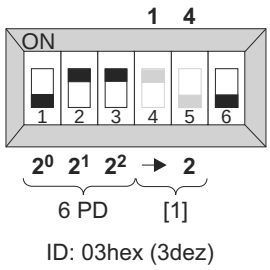

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Figure 20: Settings for operating the inverter with 6 process data items

[1] The PCP settings with S4 and S5 are ineffective.

Process data length in words	PCP length	ID code
6	PCP setting ineffective; no PCP channel can be used	03hex (3dec)

Examples:

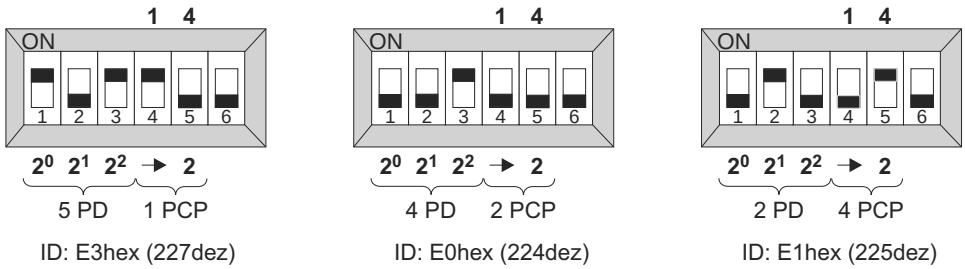

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Figure 21: Examples for setting the PCP length and the maximum process data length

PCP length	Maximum process data length	ID code
1 word	5 words	E3 hex (227dec)
2 words	4 words	E0 hex (224dec)
4 words	2 words	E1 hex (225dec)
	If the max. length is exceeded or the setting is 0 or 7 PD	38 hex (56dec) = 'Microprocessor not ready'

All settings which have not been named result in the 'Microprocessor not ready' ID code. The inverter then signals 0PD in parameter P090 'PD configuration' and indicates that the setting is incorrect by means of the red TR LED.

4.4 UL compliant installation

Please note the following points for UL compliant installation:

- Only use copper cables with the **following temperature ranges** as connection leads:
  - For MOVIDRIVE® *compact* MC_4_A0015...0300 temperature range 60/75 °C
  - For MOVIDRIVE® *compact* MC_4_A0370...0750 temperature range 75/90 °C
- The **permitted tightening torques** for MOVIDRIVE® *compact* power terminals are:
  - Size 1 → 0.6 Nm (5.3 lb.in)
  - Size 2 → 1.5 Nm (13.3 lb.in)
  - Size 3 → 3.5 Nm (31 lb.in)
  - Sizes 4 and 5 → 14 Nm (124 lb.in)
- MOVIDRIVE® *compact* drive inverters are **suitable for operation in voltage power systems with an earthed star point** (TN and TT systems) which can supply a max. current in accordance with the following tables and which have a max. voltage of 240 V_{AC} for MOVIDRIVE® *compact* MC_4_A...2_3 (230 V units) and 500 V_{AC} for MOVIDRIVE® *compact* MC_4_A...-5_3 (400/500 V units). The performance data of the fuses must not exceed the values in the tables.

400/500 V units

MOVIDRIVE® *compact* MC_4_A...5_3	Max. supply current	Max. supply voltage	Fuses
0015/0022/0030/0040	10000 A_{AC}	500 V_{AC}	30 A / 600 V
0055/0075/0110	10000 A_{AC}	500 V_{AC}	30 A / 600 V
0150/0220	5000 A_{AC}	500 V_{AC}	175 A / 600 V
0300	5000 A_{AC}	500 V_{AC}	225 A / 600 V
0370/0450	10000 A_{AC}	500 V_{AC}	350 A / 600 V
0550/0750	10000 A_{AC}	500 V_{AC}	500 A / 600 V

230 V units

MOVIDRIVE® *compact* MC_4_A...2_3	Max. supply current	Max. supply voltage	Fuses
0015/0022/0037	5000 A_{AC}	240 V_{AC}	30 A / 250 V
0055/0075	5000 A_{AC}	240 V_{AC}	30 A / 250 V
0110	5000 A_{AC}	240 V_{AC}	175 A / 250 V
0150	5000 A_{AC}	240 V_{AC}	225 A / 250 V
0220/0300	10000 A_{AC}	240 V_{AC}	350 A / 250 V

- Only use tested units with a **limited output voltage** ($V_{max = 30\ VDC}$) and **limited output current (I ≤ 8 A) as an external 24 V_{DC} voltage source**.

UL certification does not apply to operation in voltage supply systems with a non-earthed star point (IT systems).

4.5 Power shield clamp

For size 1

A power shield clamp is supplied as standard with MOVIDRIVE® *compact* size 1. Install this power shield clamp together with the retaining screws of the unit.

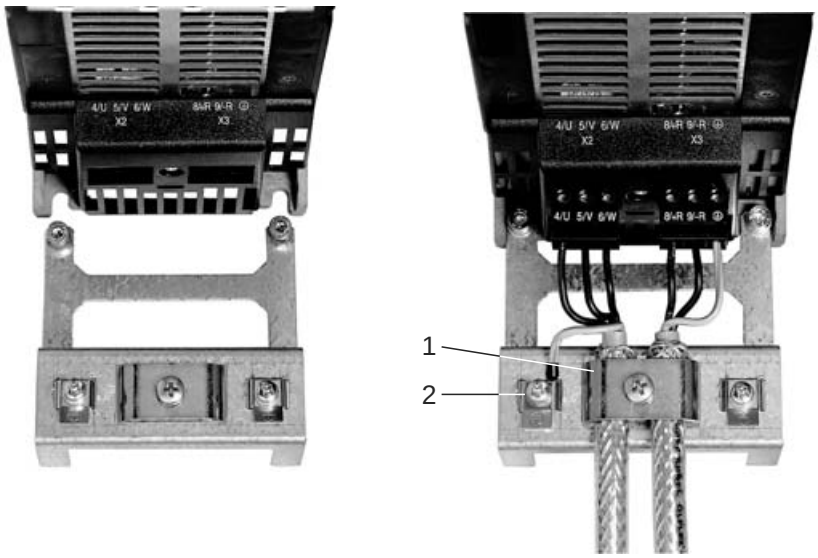

Figure 22: Power shield clamp for MOVIDRIVE® compact size 1

1. Shield clamp
2. PE connection (⏚)

For size 2

A power shield clamp with 2 retaining screws is supplied as standard with MOVIDRIVE® *compact* size 2. Install this power shield clamp together with the two retaining screws on X6.

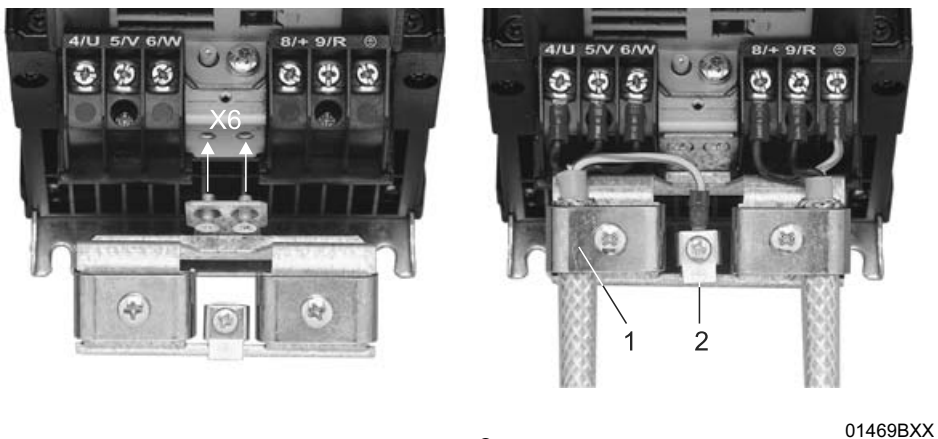

Figure 23: Power shield clamp for MOVIDRIVE® compact size 2

1. Shield clamp
2. PE connection (⏚)

Power shield clamps provide you with a very convenient way of installing the shield for the motor and brake leads. Fit the shield and PE conductor as shown in the figures.

4.6 Touch guard

Two touch guards with eight retaining screws are supplied as standard with MOVIDRIVE® *compact* sizes 4 and 5. Install the touch guard on the two hood covers for the power section terminals.

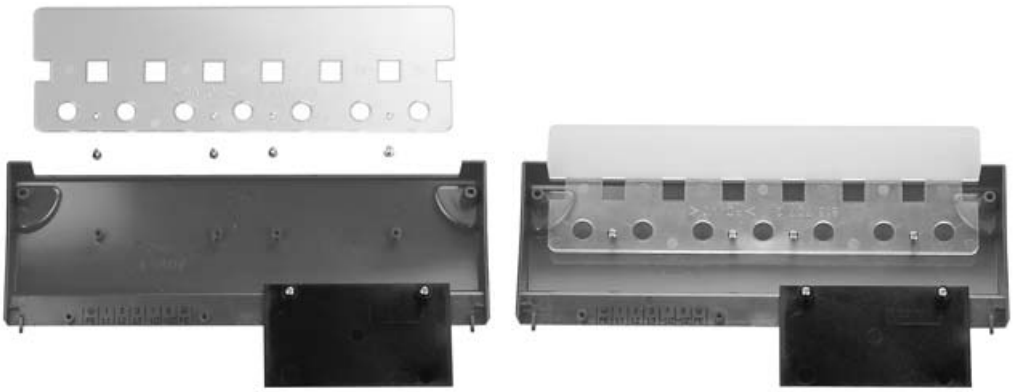

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Figure 24: Touch guard for MOVIDRIVE® compact sizes 4 and 5

With installed touch guard, MOVIDRIVE® *compact* size 4 and 5 units achieve IP10 enclosure, IP00 without touch guard.

4.7 Wiring diagram, basic unit

Connection of the power section and brake

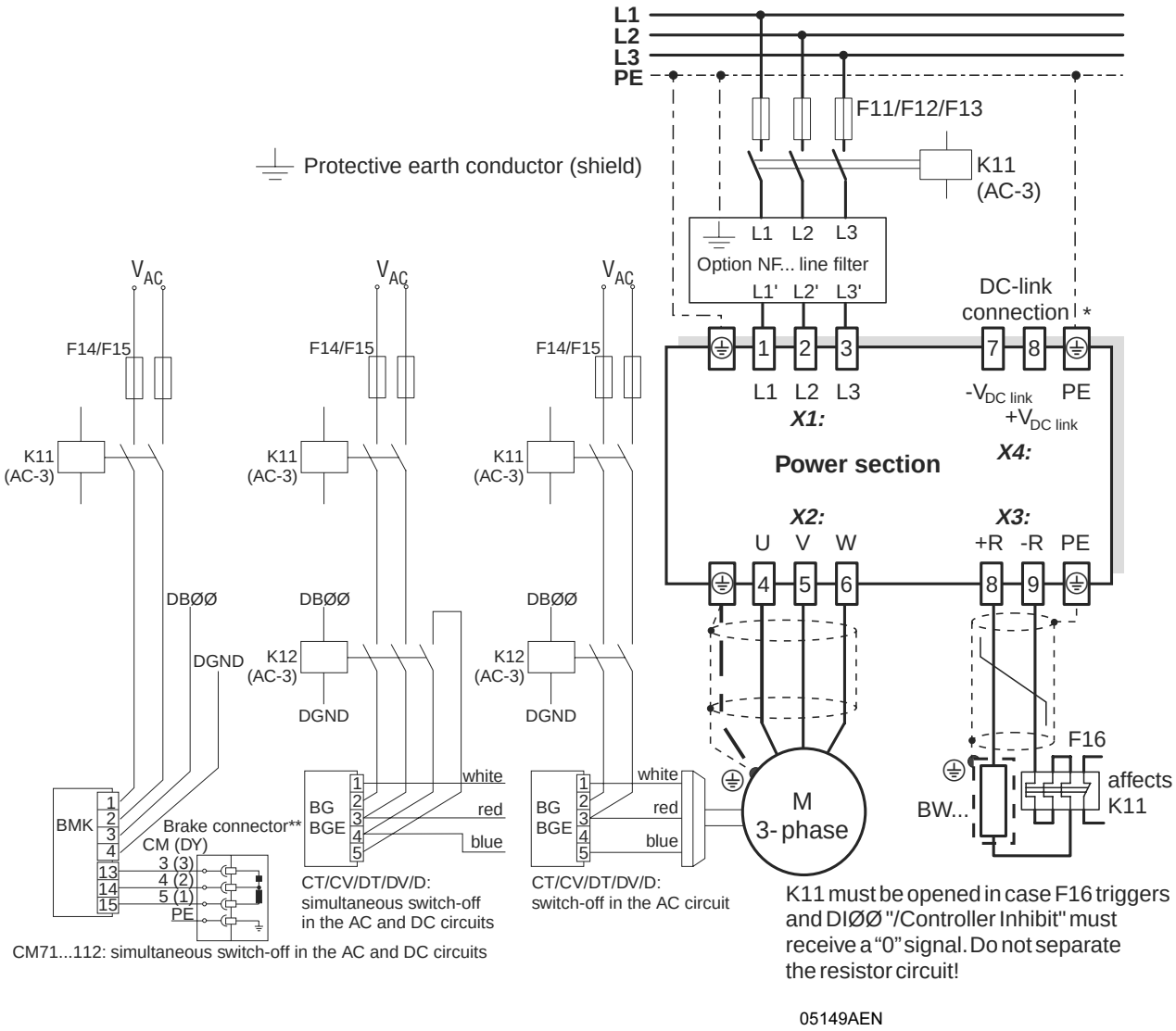


Figure 25: Wiring diagram, power section and brake

* With sizes 1 and 2, there is no PE connection next to the mains connection terminals. In this case, use the PE terminal next to the DC link connection.

** **Important:** It is essential to adhere to the sequence of connections. Incorrect connection will lead to irreparable damage to the brake.

A separate supply system lead is required for connecting the brake rectifier. Powering it from the motor voltage is not permitted!

Always switch off the brake on the DC and AC sides under the following conditions:

- all hoist applications,
- drives which require a rapid brake reaction time and
- in CFC and SERVO operating modes.

Brake rectifier in switch cabinet

Route the connection cables between the brake rectifier and the brake separately from other power cables when installing the brake rectifier in the switch cabinet. Joint routing is only permitted if the power cables are shielded.

MCH4_A: Control unit connection

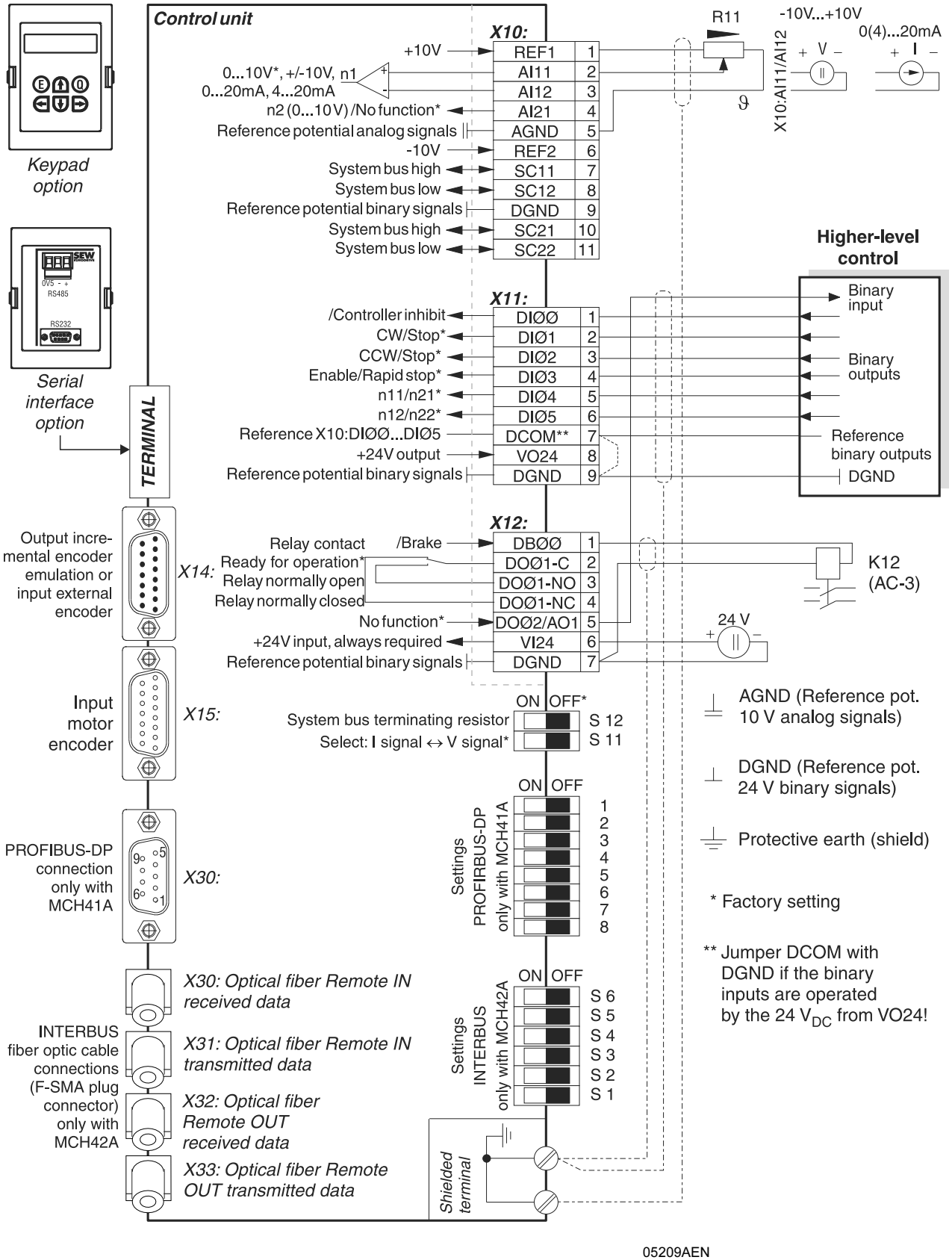


Figure 26: Wiring diagram, MCH4_A control unit

- **MCH41A (with PROFIBUS-DP) / MCH42A (with INTERBUS FO):** SEW recommends always supplying these units with 24 V_{DC} at terminal X10:24 (VI24). This external 24 V_{DC} power supply must be capable of supplying a continuous power of 50 W and a peak power (1 s) of 100 W.
- Analog input AI21 (X10:4) can be used either as a 10 V voltage input or as a TF/TH input. It is changed over using parameter P120.
- DIP switches S11, S12, 1...8 and S1...S6 can only be accessed when the connection unit has been removed (→ Sec. 'Removing the connection unit' on page 32).
- The function of DIP switches 1...8 is explained in Secs. 'Bus termination with MCH41A' and 'Setting the station address with MCH41A' on page 18 and page 19.
- The function of DIP switches S1...S6 is explained in Sec. 'DIP switch settings' on page 22.
- The TF/TH line must either be shielded or laid at a distance of at least 0.2 m (8 in) from power cables (e.g. motor or brake cables). The TF/TH line must be separately shielded if hybrid cables are used for the motor and TF/TH connection.

STOP

If a TF/TH is connected to X15:6 and X15:14 then no TF/TH connection is permitted on X10:1 and X10:4! However, terminal X10:4 can be used as a 10 V voltage input.

Analog output AO1

With MCH4_A, binary output DOØ2 (X12:5) can also be used as a 0(4)...20 mA analog output AO1. It is changed over using parameters P621 'Binary output DOØ2' and P642 'Operating mode AO1'.

Function of X12:5	P621 'Binary output DO02'	P642 'Operating mode AO1'
Binary output DOØ2	≠ Set to NO FUNCTION	Set to OFF
Analog output AO1	Set to NO FUNCTION	≠ Set to OFF
	≠ Set to NO FUNCTION	≠ Set to OFF
NO FUNCTION	Set to NO FUNCTION	Set to OFF

MCH4_A: Description of terminal functions on the basic unit

Terminal		Function	
X1:1/2/3 **X2:4/5/6** **X3:8/9** **X4:**	**L1/L2/L3** **U/V/W** **+R/-R** **+U_Z/-U_Z**	Mains connection Motor connection Braking resistor connection DC link connection	
X10:1 **X10:2/3** **X10:4** **X10:5** **X10:6**	**REF1** **AI11/12** **AI21** **AGND** **REF2**	+10 V (max. 3 mA) for setpoint potentiometer Setpoint input n1 (differential input or input with AGND reference potential), signal form → P11_ / S11 Either setpoint input n2 (0...10 V) or TF/TH input, setting → P120 Reference potential for analog signals (REF1, REF2, AI..) -10 V (max. 3 mA) for setpoint potentiometer	
X10:7/8 **X10:9** **X10:10/11**	**SC11/SC12** **DGND** **SC21/SC22**	System bus high/low, direct electrical connection to SC21/SC22 (X10:10/X10:11) Reference potential system bus System bus high/low, direct electrical connection to SC11/SC12 (X10:7/X10:8)	
X11:1 **X11:2** **X11:3** **X11:4** **X11:5** **X11:6**	**DIØØ** **DIØ1** **DIØ2** **DIØ3** **DIØ4** **DIØ5**	Binary input 1, with fixed assignment '/Controller inhibit' Binary input 2, factory setting 'CW/stop' Binary input 3, factory setting 'CCW/stop' Binary input 4, factory setting 'Enable/rapid stop' Binary input 5, factory setting 'n11/n12' Binary input 6, factory setting 'n12/n22'	• The binary inputs are electrically isolated by opto-couplers. • Selection options for binary inputs 2 to 6 (DIØ1...DIØ5) → Parameter menu P60_
X11:7	**DCOM**	Reference for binary inputs DIØØ to DIØ5 (X11:1 to X11:6) • Switching of binary inputs with +24 V external voltage: DCOM (X11:7) must be connected to the reference potential of the external voltage. – Without jumper DCOM-DGND (X11:7-X11:9) → Isolated binary inputs – With jumper DCOM-DGND (X11:7-X11:9) → Non-isolated binary inputs • Switching of binary inputs with +24 V from VO24 (X11:8) → DCOM-DGND jumper required.	
X11:8 **X11:9**	**VO24** **DGND**	Auxiliary supply output +24 V (max. 200 mA) for external command switches Reference potential for binary signals	
X12:1 **X12:2** **X12:3** **X12:4** **X12:5** **X12:6** **X12:7**	**DBØØ** **DOØ1-C** **DOØ1-NO** **DOØ1-NC** **DOØ2/AO1** **VI24** **DGND**	Binary output 0, with fixed assignment '/Brake', load capacity max. 150 mA (short-circuit proof) Shared contact binary output 1, factory setting: 'Ready' Normally open contact binary output 1, load capacity of the relay contacts max. 30 V_{DC} and 0.8 A NC contact binary output 1 Binary output 2, factory setting: 'No function', load capacity max. 50 mA (short-circuit proof) can also be used as analog output AO1, switchover with P621 and P642 Selection options for binary outputs 1 and 2 (DOØ1 and DOØ2) → Parameter menu P62_ **Do not apply an external voltage to binary outputs DBØØ (X12:1) and DOØ2/AO1 (X12:5)!** Input +24 V voltage supply (backup voltage, unit diagnosis when supply system off) Reference potential for binary signals	
X14:1 **X14:2** **X14:3** **X14:4** **X14:5/6** **X14:7** **X14:8** **X14:9** **X14:10** **X14:11** **X14:12** **X14:13/14** **X14:15**	**Input of external encoder or output of incremental encoder simulation**	Signal track A (K1) Signal track B (K2) Signal track C (K0) DATA+ Reserved Switchover Ref. potential DGND Signal track $\overline{A}$ ($\overline{K1}$) Signal track $\overline{B}$ ($\overline{K2}$) Signal track $\overline{C}$ ($\overline{K0}$) DATA- Reserved +12 V (max. 180 mA)	The following encoders are allowed to be connected as external encoders: • Hiperface encoder type AS1H, ES1H or AV1H • sin/cos encoder type ES1S, ES2S or EV1S • 5 V TTL sensor with 24 V_{DC} voltage supply type ES1R, ES2R or EV1R • 5 V TTL sensor with 5 V_{DC} voltage supply type ES1T, ES2T or EV1T via DWI11A option If X14: is used as an incremental encoder simulation output, the switchover (X14:7) must be jumpered with DGND (X14:8). The 12 V_{DC} supply from X14 and X15 is sufficient to operate SEW encoders with a 24 V_{DC} supply.
X15:1 **X15:2** **X15:3** **X15:4** **X15:5** **X15:6** **X15:7** **X15:8** **X15:9** **X15:10** **X15:11** **X15:12** **X15:13** **X15:14** **X15:15**	**Motor encoder input**	Signal track A (K1) Signal track B (K2) Signal track C (K0) DATA+ Reserved TF2 Reserved Ref. potential DGND Signal track $\overline{A}$ ($\overline{K1}$) Signal track $\overline{B}$ ($\overline{K2}$) Signal track $\overline{C}$ ($\overline{K0}$) DATA- Reserved TF2 +12 V (max. 180 mA)	The following encoders are allowed to be connected: • Hiperface encoder type AS1H or ES1H • sin/cos encoder type ES1S, ES2S or EV1S • 5 V TTL sensor with 24 V_{DC} voltage supply type ES1R, ES2R or EV1R • 5 V TTL sensor with 5 V_{DC} voltage supply type ES1T, ES2T or EV1T via DWI11A option The 12 V_{DC} supply from X14 and X15 is sufficient to operate SEW encoders with a 24 V_{DC} supply.
S1...S6		DIP switches for INTERBUS settings → Sec. 'Setting the DIP switches' (page 22)	
S11: **S12:**		Switch mode I signal (0(4)...20 mA) ↔ V signal (-10 V...0...10 V, 0...10 V), factory setting: V signal Switch system bus terminating resistor on or off, factory setting: switched off	
TERMINAL		Option slot for DBG11B keypad or serial port USS21A (RS-232 and RS-485)	

MCH42A: Assignment of electronics terminals and labeling tile

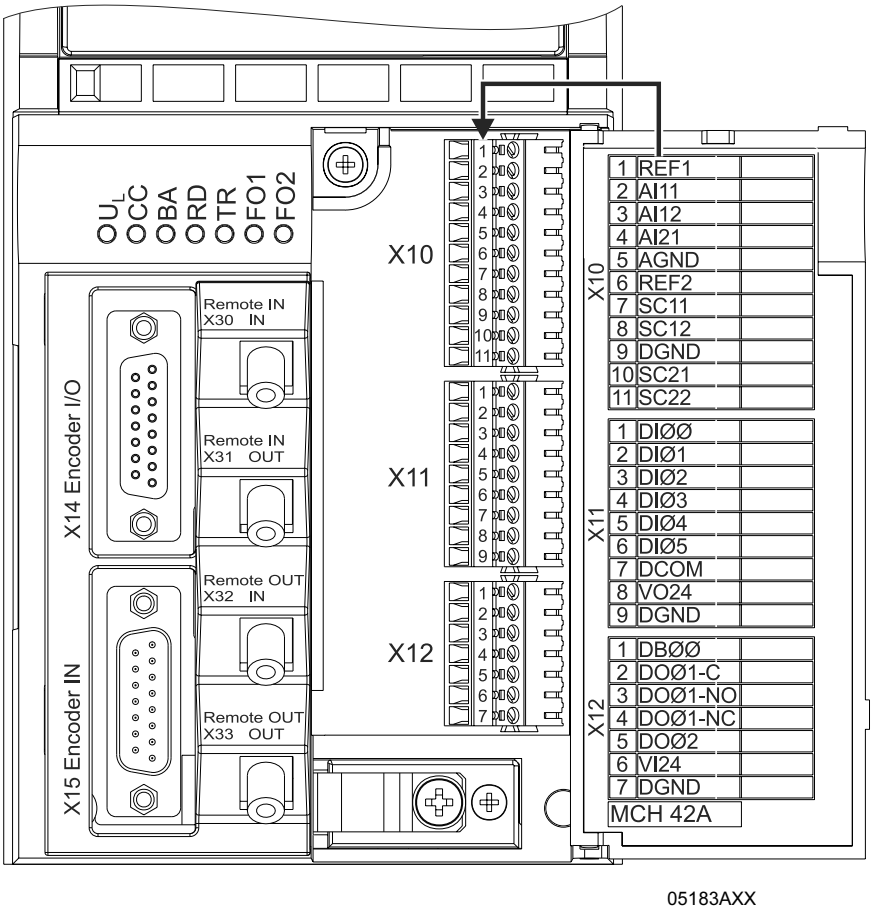


Figure 27: Electronics terminals and labeling tile, example of MCH42A

4.8 Removing the terminal unit

STOP

First switch off the supply system and the 24 V_{DC} backup voltage, then remove the terminal unit.

You can remove the entire terminal unit completely from the control unit in order to facilitate installation of the control cables. You have to remove the terminal unit in order to set the DIP switches for PROFIBUS (1...10), INTERBUS (S1...S6), signal switchover n1 (S11) and SBus terminating resistor (S12). Proceed as follows to do this:

1. Open the flap on the terminal unit.
2. Unscrew retaining screws A and B; they are captive screws and cannot fall out.
3. Remove the terminal unit from the control unit.

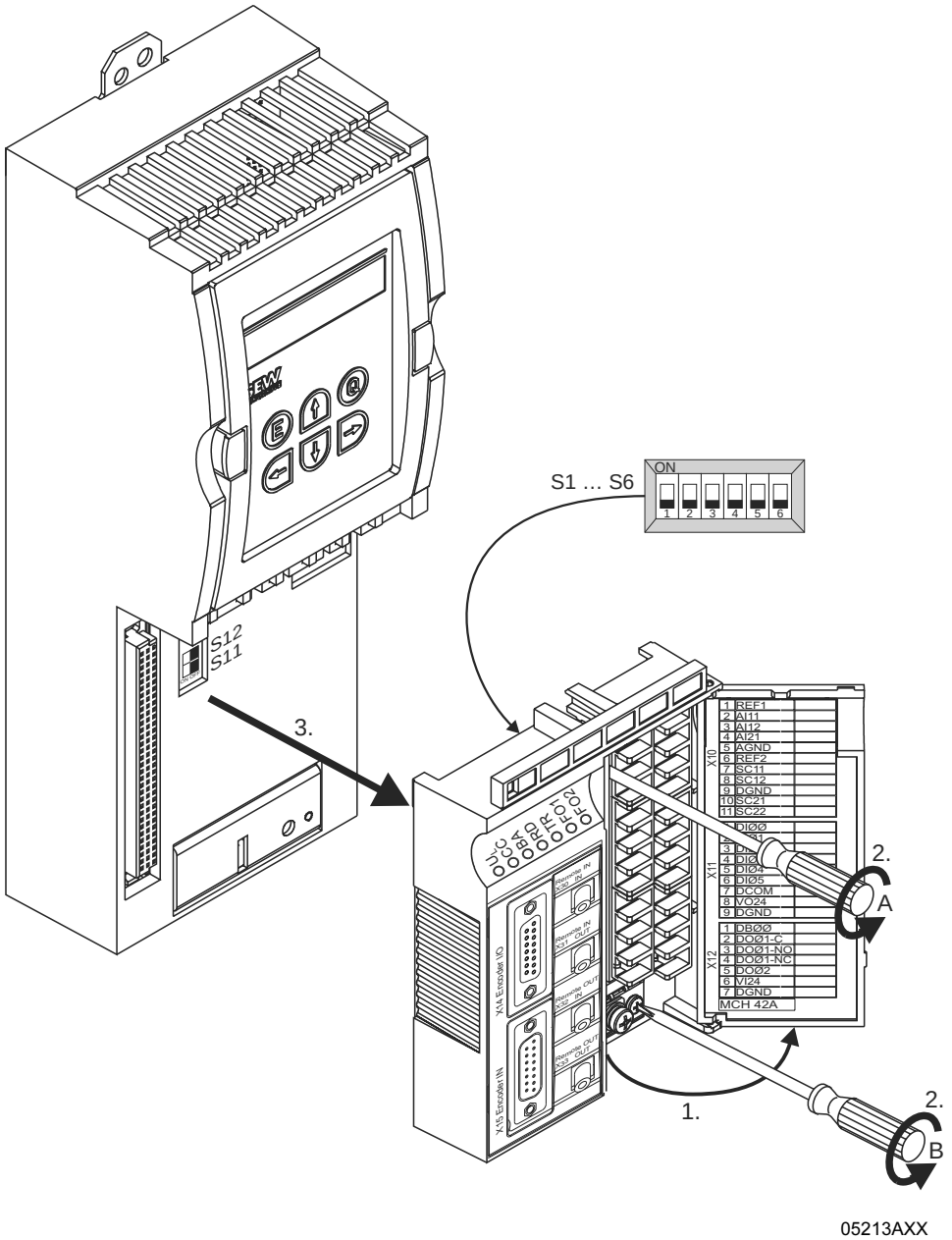


Figure 28: Removing the terminal unit, for example with MCH42A

Follow the instructions in reverse order when installing the terminal unit.

4.9 Assignment of braking resistors, chokes and filters

400/500 V units, sizes 1 and 2

MOVIDRIVE® *compact* MC_4_A...-5A3			0015	0022	0030	0040	0055	0075	0110
Size			1				2		
Braking resistors	**Trip current**	**Part number**							
BW100-005	I_F = 0.8 A_{RMS}	826 269 1							
BW100-006	I_F = 1.8 A_{RMS}	821 701 7							
BW168	I_F = 2.5 A_{RMS}	820 604 X							
BW268	I_F = 3.4 A_{RMS}	820 715 1							
BW147	I_F = 3.5 A_{RMS}	820 713 5							
BW247	I_F = 4.9 A_{RMS}	820 714 3							
BW347	I_F = 7.8 A_{RMS}	820 798 4							
BW039-012	I_F = 4.2 A_{RMS}	821 689 4							
BW039-026	I_F = 7.8 A_{RMS}	821 690 8							
BW039-050	I_F = 11 A_{RMS}	821 691 6							
Line chokes		**Part number**							
ND020-013	ΣI_{mains} = 20 A_{AC}	826 012 5							
ND045-013	ΣI_{mains} = 45 A_{AC}	826 013 3							
Line filters		**Part number**							
NF009-503	V_{max} = 550 V_{AC}	827 412 6				A			
NF014-503		827 116 X				B		A	
NF018-503		827 413 4						B	
NF035-503		827 128 3							
Output chokes	**Inside diameter**	**Part number**							
HD001	d = 50 mm (1.97 in)	813 325 5	For cable cross sections 1.5...16 mm^2 (AWG 16...6)						
HD002	d = 23 mm (0.91 in)	813 557 6	For cable cross sections ≤ 1.5 mm^2 (AWG 16)						
HD003	d = 88 mm (4.46 in)	813 558 4	For cable cross sections > 16 mm^2 (AWG 6)						
Output filters (in VFC mode only)		**Part number**							
HF015-503		826 030 3	A						
HF022-503		826 031 1	B	A					
HF030-503		826 032 X		B	A				
HF040-503		826 311 6			B	A			
HF055-503		826 312 4				B	A		
HF075-503		826 313 2					B	A	
HF023-403		825 784 1						B	A
HF033-403		825 785 X							B

A In rated operation (100 %)

B With variable torque load in VFC mode (125 %)

400/500 V units, sizes 3 to 5

MOVIDRIVE® *compact* MC_4_A...-503			0150	0220	0300	0370	0450	0550	0750
Size			3			4		5	
Braking resistors	**Trip current**	**Part number**							
BW018-015	I_F = 4.0 A_{RMS}	821 684 3				C	C		
BW018-035	I_F = 8.1 A_{RMS}	821 685 1				C	C		
BW018-075	I_F = 14 A_{RMS}	821 686 X				C	C		
BW915	I_F = 28 A_{RMS}	821 260 0							
BW012-025	I_F = 6.1 A_{RMS}	821 680 0							
BW012-050	I_F = 12 A_{RMS}	821 681 9							
BW012-100	I_F = 22 A_{RMS}	821 682 7							
BW106	I_F = 38 A_{RMS}	821 050 0							
BW206	I_F = 42 A_{RMS}	821 051 9							
Line chokes		**Part number**							
ND045-013	ΣI_{mains} = 45 A_{AC}	826 013 3		A					
ND085-013	ΣI_{mains} = 85 A_{AC}	826 014 1		B			A		
ND1503	ΣI_{mains} = 150 A_{AC}	825 548 2					B		
Line filters		**Part number**							
NF035-503	V_{max} = 550 V_{AC}	827 128 3	A						
NF048-503		827 117 8	B	A					
NF063-503		827 414 2		B	A				
NF085-503		827 415 0			B		A		
NF115-503		827 416 9					B	A	
NF150-503		827 417 7						B	
Output chokes	**Inside diameter**	**Part number**							
HD001	d = 50 mm (1.97 in)	813 325 5	For cable cross sections 1.5...16 mm^2 (AWG 16...6)						
HD003	d = 88 mm (4.46 in)	813 558 4	For cable cross sections > 16 mm^2 (AWG 6)						
Output filters (only in VFC mode)		**Part number**							
HF033-403		825 785 X	A	B / D	A / D				
HF047-403		825 786 8	B	A					
HF450-503		826 948 3			B		E	D	D

A In rated operation (100 %)

B With variable torque load in VFC mode (125 %)

C Connect two braking resistors in parallel and set twice the trip current on F16 ($2 \times I_F$)

D Connect two output filters in parallel

E In rated operation (100 %): One output filter
With variable torque load (125 %): Connect two output filters in parallel

230 V units, sizes 1 to 4

MOVIDRIVE® *compact* MC_4_A...-2_3			0015	0022	0037	0055	0075	0110	0150	0220	0300
Size			1			2		3		4	
Braking resistors	**Trip current**	**Part number**									
BW039-003	I_F = 2.0 A_{RMS}	821 687 8									
BW039-006	I_F = 3.2 A_{RMS}	821 688 6									
BW039-012	I_F = 4.2 A_{RMS}	821 689 4									
BW039-026	I_F = 7.8 A_{RMS}	821 690 8									
BW027-006	I_F = 2.5 A_{RMS}	822 422 6									
BW027-012	I_F = 4.4 A_{RMS}	822 423 4									
BW018-015	I_F = 4.0 A_{RMS}	821 684 3						C	C	C	C
BW018-035	I_F = 8.1 A_{RMS}	821 685 1						C	C	C	C
BW018-075	I_F = 14 A_{RMS}	821 686 X						C	C	C	C
BW915	I_F = 28 A_{RMS}	821 260 0						C	C	C	C
BW012-025	I_F = 10 A_{RMS}	821 680 0									
BW012-050	I_F = 19 A_{RMS}	821 681 9									
BW012-100	I_F = 27 A_{RMS}	821 682 7									
BW106	I_F = 38 A_{RMS}	821 050 0								C	C
BW206	I_F = 42 A_{RMS}	821 051 9								C	C
Line chokes		**Part number**									
ND020-013	ΣI_{mains} = 20 A_{AC}	826 012 5				A					
ND045-013	ΣI_{mains} = 45 A_{AC}	826 013 3				B		A			
ND085-013	ΣI_{mains} = 85 A_{AC}	826 014 1						B		A	
ND1503	ΣI_{mains} = 150 A_{AC}	825 548 2								B	
Line filters		**Part number**									
NF009-503	V_{max} = 550 V_{AC}	827 412 6		A							
NF014-503		827 116 X		B	A						
NF018-503		827 413 4			B						
NF035-503		827 128 3									
NF048-503		827 117 8						A			
NF063-503		827 414 2						B			
NF085-503		827 415 0								A	
NF115-503		827 416 9								B	
Output chokes	**Inside diameter**	**Part number**									
HD001	d = 50 mm (1.97 in)	813 325 5	For cable cross sections 1.5...16 mm^2 (AWG 16...6)								
HD002	d = 23 mm (0.91 in)	813 557 6	For cable cross sections ≤ 1.5 mm^2 (AWG 16)								
HD003	d = 88 mm (4.46 in)	813 558 4	For cable cross sections > 16 mm^2 (AWG 6)								

A In rated operation (100 %)

B With variable torque load in VFC mode (125 %)

C Connect two braking resistors in parallel and set twice the trip current on F16 ($2 \times I_F$)

4.10 System bus (SBus) installation

Only when P816 'SBus baud rate' = 1000 kbaud:

MOVIDRIVE® *compact* MCH4_A units are not to be combined with other MOVIDRIVE® units in the same system bus combination.

The units can be combined at baud rates ≠ 1000 kbaud.

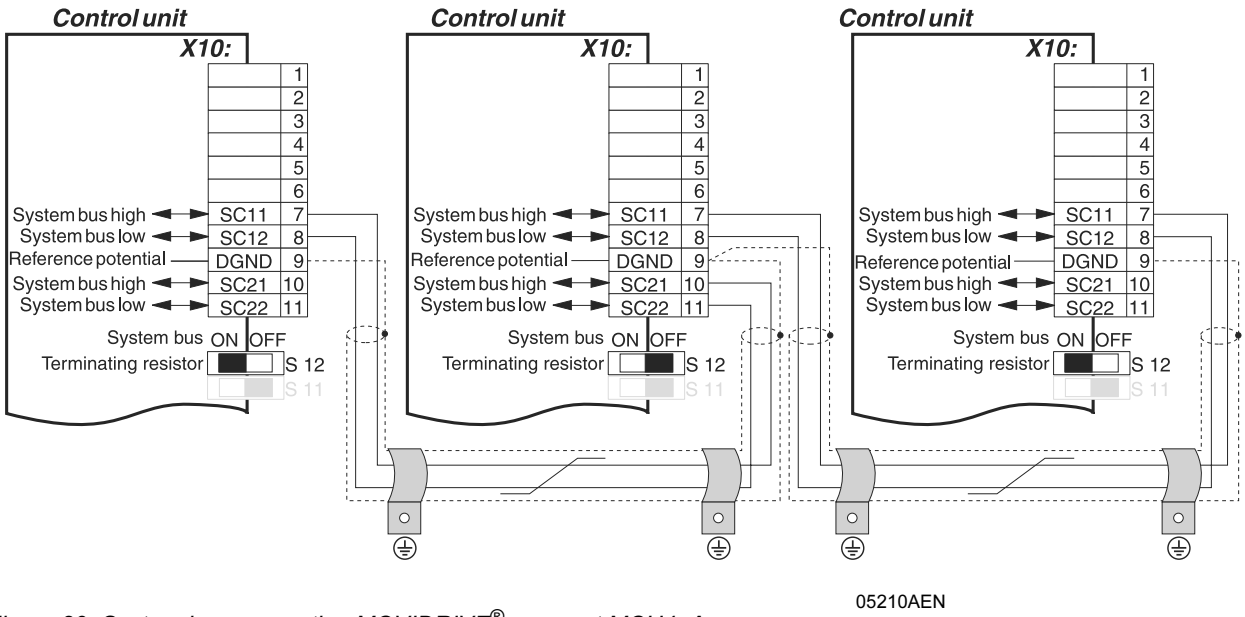


Figure 29: System bus connection MOVIDRIVE® compact MCH4_A

SBus MCH4_A: Connect the terminating equipment to SC11/SC12. SC21/SC22 are only active when S12 = OFF.

Cable specification

- Use a 2-core twisted and shielded copper cable (data transmission cable with shield comprising copper braiding). The cable must meet the following specifications:
  - Conductor cross section 0.75 mm^2 (AWG 18)
  - Cable resistance 120 Ω at 1 MHz
  - Capacitance per unit length ≤ 40 pF/m (12 pF/ft) at 1 kHz

  Suitable cables are CAN bus or DeviceNet cables, for example.

Shield contact

- Connect the shield at either end to the electronics shield clamp of the inverter or the master control and ensure the shield is connected over a large area. Also connect the ends of the shield to DGND.

Line length

- The permitted total cable length depends on the baud rate setting of the SBus (P816):
  - 125 kbaud → 320 m (1056 ft)
  - 250 kbaud → 160 m (528 ft)
  - **500 kbaud → 80 m (264 ft)**
  - 1000 kbaud → 40 m (132 ft)

Terminating resistor

- Switch on the system bus terminating resistor (S12 = ON) at the start and finish of the system bus connection. Switch off the terminating resistor on the other units (S12 = OFF).

- There must not be any potential displacement between the units connected using the SBus. Take suitable measures to avoid a potential displacement, e.g. by connecting the unit ground connectors using a separate lead. Do not use the shield of the SBus cable for equipotential bonding!

4.11 Connection of option USS21A (RS-232 and RS-485)

Part number USS21A: 822 914 7

RS-232 connection

- Use a shielded standard interface cable with 1:1 connection assignment for connecting to the RS-232 interface.

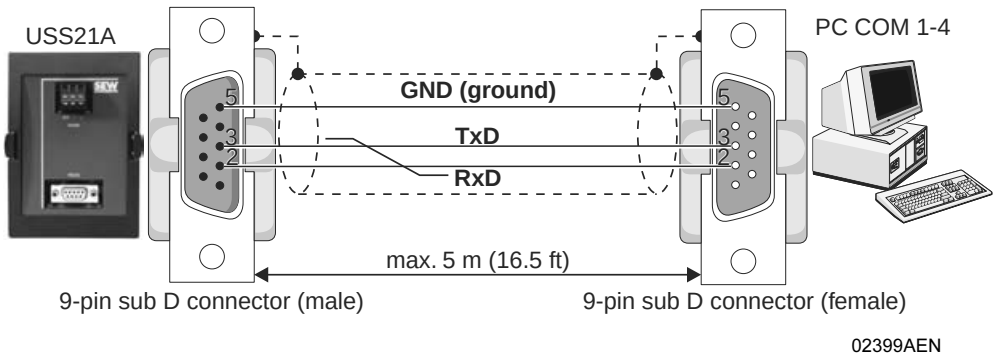


Figure 30: USS21A-PC connection cable (1:1 connection assignment)

RS-485 connection

Please observe the following connection instructions:

- Use a 2-core twisted and shielded copper cable (data transmission cable with shield comprising copper braiding). The cable must meet the following specifications:
  - Conductor cross section 0.5...0.75 mm^2 (AWG 20...18)
  - Cable resistance 100...150 Ω at 1 MHz
  - Capacitance per unit length ≤ 40 pF/m (12 pF/ft) at 1 kHz

  The following cable is suitable, for example:
  - BELDEN (www.belden.com), data cable type 3105A
- Connect the shield at either end to the electronics shield clamp of the inverter and ensure the shield is connected over a large area. Also connect the ends of the shield to DGND.

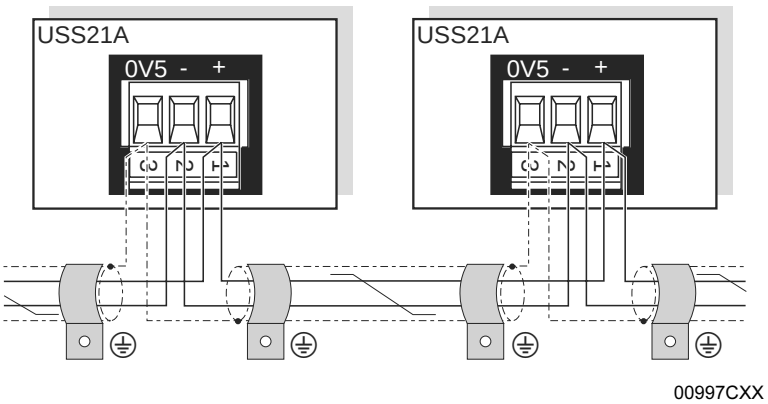


Figure 31: RS-485 interface of the USS21A

EIA standard

The RS-485 interface of the USS21A corresponds to the EIA standard:

- Max. transmission rate 9600 baud
- Max. 32 stations (each unit with USS21A counts as 2 stations)
- Max. cable length 200 m (660 ft) in total
- Dynamic terminating resistor with fixed installation

4.12 Connection of motor encoder and external encoder

The 'SEW Encoder Systems' manual contains detailed information. This manual can be obtained from SEW.

General installation notes

- Max. line length (inverter-encoder): 100 m (330 ft) with a capacitance per unit length ≤ 120 nF/km (193 nF/mile).
- Core cross section
  - Hiperface encoder, sin/cos encoder and TTL sensor with 5 V_{DC} supply (via DWI11A): 0.25...0.5 mm^2 (AWG 23...20)
  - TTL sensor with 12...24 V_{DC} supply: 0.5 mm^2 (AWG 20)
- If you cut off a core of the encoder cable: Isolate the cut-off end of the core.
- Use shielded cables with twisted pairs of insulated conductors and connect the shield at both ends:
  - to the encoder in the cable screw fitting or in the encoder plug
  - to the inverter in the housing of the sub D plug and to the electronics shield clamp of the inverter
- Use encoder plugs and sub D plugs with a metal housing.
- Route the encoder cable separately from the power cables.
- Encoder with cable gland: Please note permitted diameter of the encoder cable for correct function of cable gland.

Shield contact

Connect the shield of the encoder cable over a large area.

On the inverter

Connect the shield on the inverter end in the housing of the sub D plug.

01939BXX

Figure 32: Connect the shield in the sub D connector

On the encoder

Connect the shield on the encoder end in the cable screw fitting or in the encoder plug.

01948AXX

Figure 33: Connect the shield in the cable screw fitting of the encoder

Pre-fabricated cables

- SEW offers pre-fabricated cables for connecting encoders. We recommend using these pre-fabricated cables.

- The conductor colors specified in the connection figures are in accordance with IEC 757 and correspond to the conductor colors used in the pre-fabricated cables from SEW.

Motor encoder

The following motor encoders have been approved for connection to X15: of MOVIDRIVE® *compact* MCH units:

- Hiperface encoders
- High-resolution sin/cos encoders with signal voltage 1 V_{SS}
- TTL sensors with signal level to RS-422

05232AXX

Figure 34: SEW encoders with plug connection or connection terminals

Voltage supply

Encoders with 12...24 V_{DC} voltage supply (max. 180 mA) are connected directly to X15:. These encoders are then powered by the inverter.

Encoders with a 5 V_{DC} voltage supply must be connected via the '5 V encoder power supply type DWI11A' option (part number 822 759 4).

Hiperface encoders

Hiperface encoders AS1H, ES1H and AV1H are recommended for operation with MOVIDRIVE® *compact* MCH4_A. Depending on the motor type and motor configuration, the encoder connection takes the form of a plug connection or terminal box.

CM71...112 with plug connection

Connect the Hiperface encoder as follows:

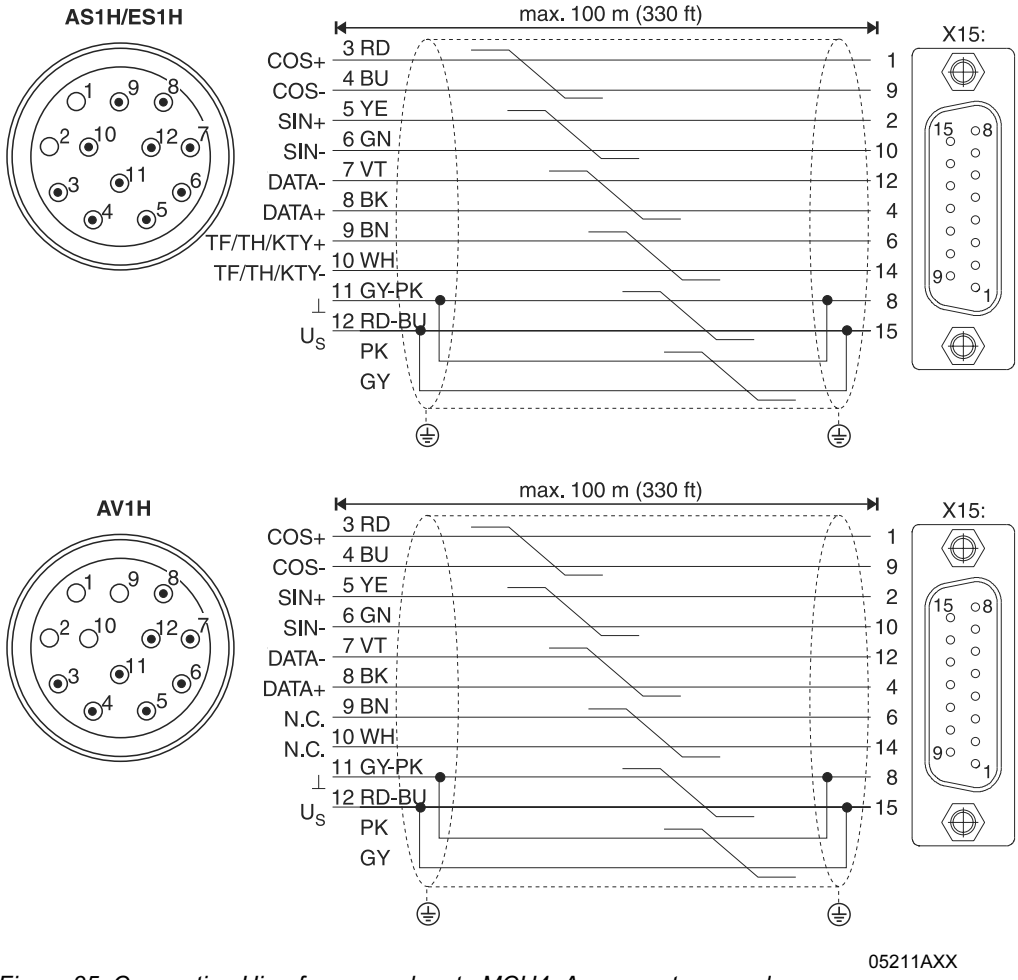


Figure 35: Connecting Hiperface encoders to MCH4_A as a motor encoder

Part numbers of the pre-fabricated cables:

- For fixed routing: 199 488 3
- For cat track routing: 199 320 8

Part numbers of the pre-fabricated extension cables:

- For fixed routing: 199 539 1
- For cat track routing: 199 540 5

CM71...112 with terminal box

Connect the Hiperface encoder as follows:

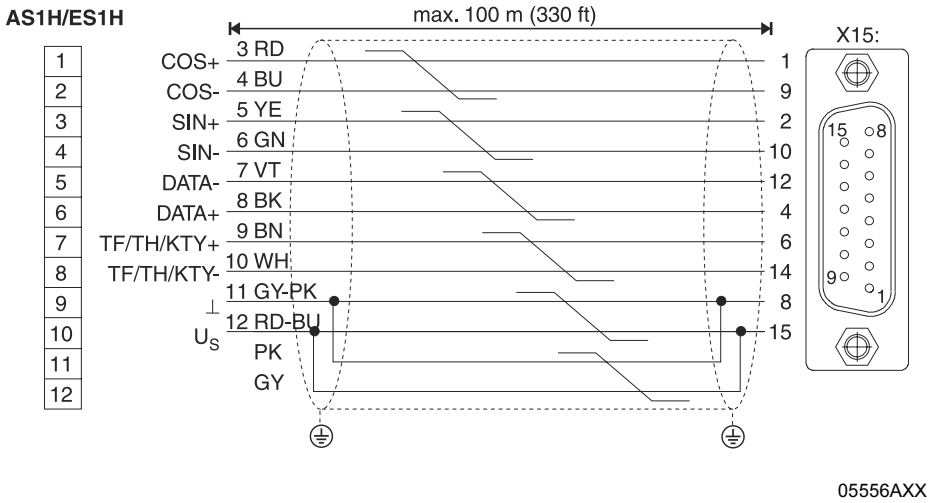


Figure 36: Connecting Hiperface encoders to MCH4_A as a motor encoder

Part numbers of the pre-fabricated cables:

- For fixed routing: 199 591 X
- For cat track routing: 199 592 8

sin/cos encoders

High-resolution sin/cos encoders ES1S, ES2S or EV1S have also been approved for connection to MOVIDRIVE® *compact* MCH4_A. Connect the sin/cos encoder as follows:

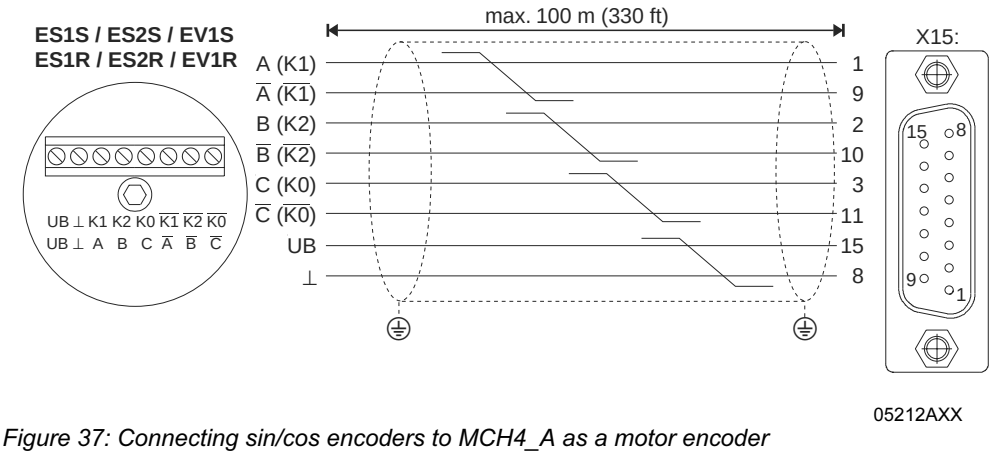


Figure 37: Connecting sin/cos encoders to MCH4_A as a motor encoder

TTL sensors

TTL sensors from SEW are available with a 12...24 V_{DC} voltage supply and a 5 V_{DC} voltage supply.

12...24 V_{DC} voltage supply

Connect TTL sensors with 12...24 V_{DC} voltage supply ES1R, ES2R or EV1S in the same way as the high-resolution sin/cos encoders.

5 V_{DC} voltage supply

TTL sensors with a 5 V_{DC} voltage supply ES1T, ES2T or EV1T must be connected via the '5 V encoder power supply type DWI11A' option (part number 822 759 4). The sensor cable must be connected as well in order to correct the supply voltage of the encoder. Connect these encoders as follows:

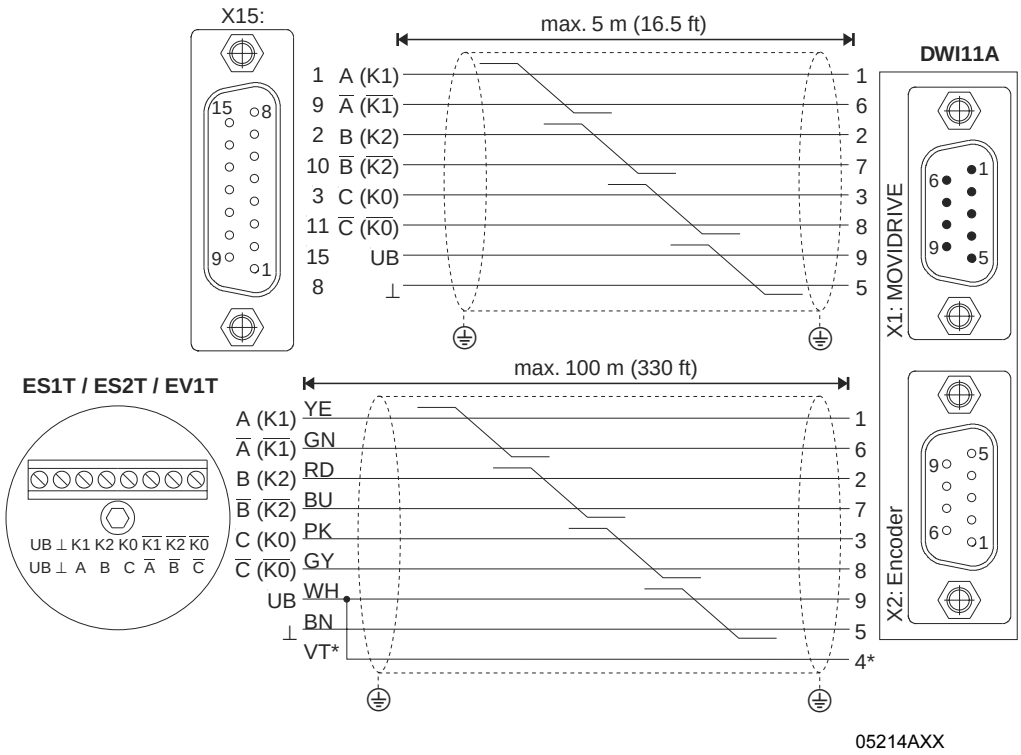


Figure 38: Connecting TTL sensors via DWI11A to MCH4_A as a motor encoder

* Connect the sensor line (VT) on the encoder to UB, do not jumper on the DWI11A!

Part numbers of the pre-fabricated cables:

- Encoder ES1T / ES2T / EV1T → DWI11A X2:Encoder
  - For fixed routing: 198 829 8
  - For cat track routing: 198 828 X

External encoders

The following motor encoders are allowed to be connected to X14: of MOVIDRIVE® *compact* units:

- Hiperface encoders
- High-resolution sin/cos encoders with signal voltage 1 V_{SS}
- 5 V TTL sensors with signal level to RS-422

Voltage supply

Encoders with 12/24 V_{DC} voltage supply (max. 180 mA) are connected directly to X14:. These encoders are then powered by the inverter.

Encoders with a 5 V_{DC} voltage supply must be connected via the '5 V encoder power supply type DWI11A' option (part number 822 759 4).

Hiperface encoders

Hiperface encoders AS1H are recommended for operation with MOVIDRIVE® *compact* MCH4_A. Connect the Hiperface encoder as follows:

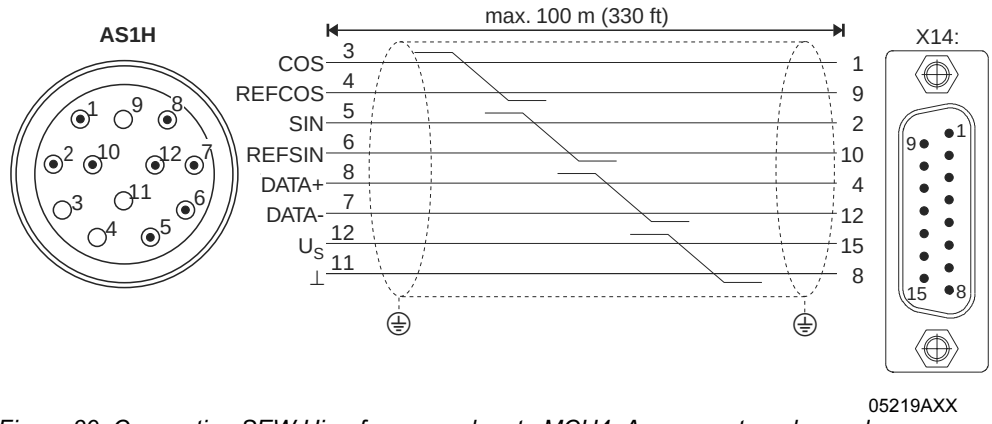


Figure 39: Connecting SEW Hiperface encoders to MCH4_A as an external encoder

sin/cos encoders

Connect the sin/cos encoder as follows:

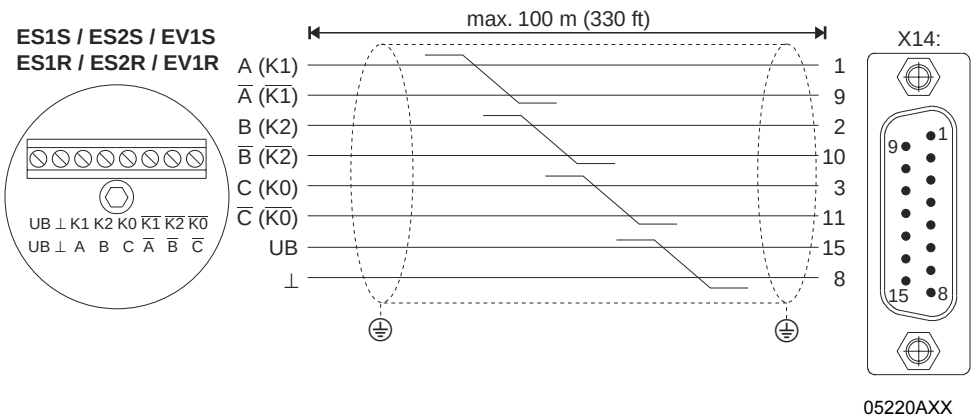


Figure 40: Connecting sin/cos encoders to MCH4_A as an external encoder

5 V TTL sensors

5 V TTL sensors from SEW are available with a 24 V_{DC} voltage supply and a 5 V_{DC} voltage supply.

24 V_{DC} voltage supply

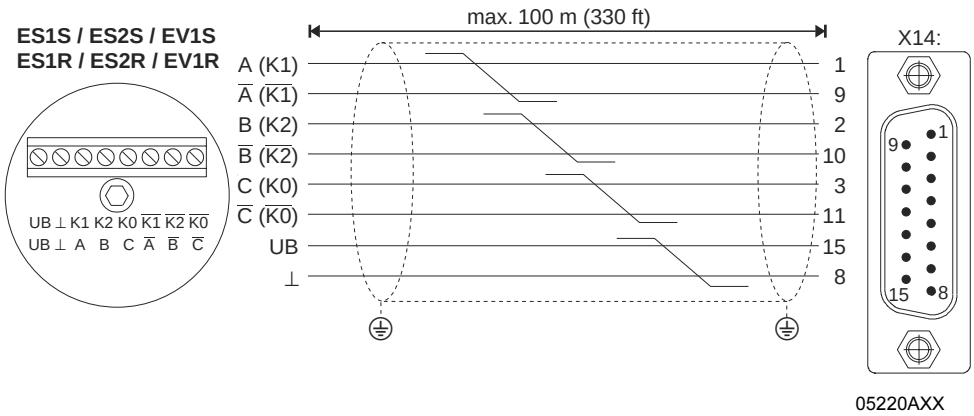


Figure 41: Connecting TTL sensors to MCH4_A as an external encoder

5 V_{DC} voltage supply

5 V TTL sensors with a 5 V_{DC} voltage supply ES1T, ES2T or EV1T must be connected via the '5 V encoder power supply type DWI11A' option (part number 822 759 4). The sensor cable must be connected as well in order to correct the supply voltage of the encoder.

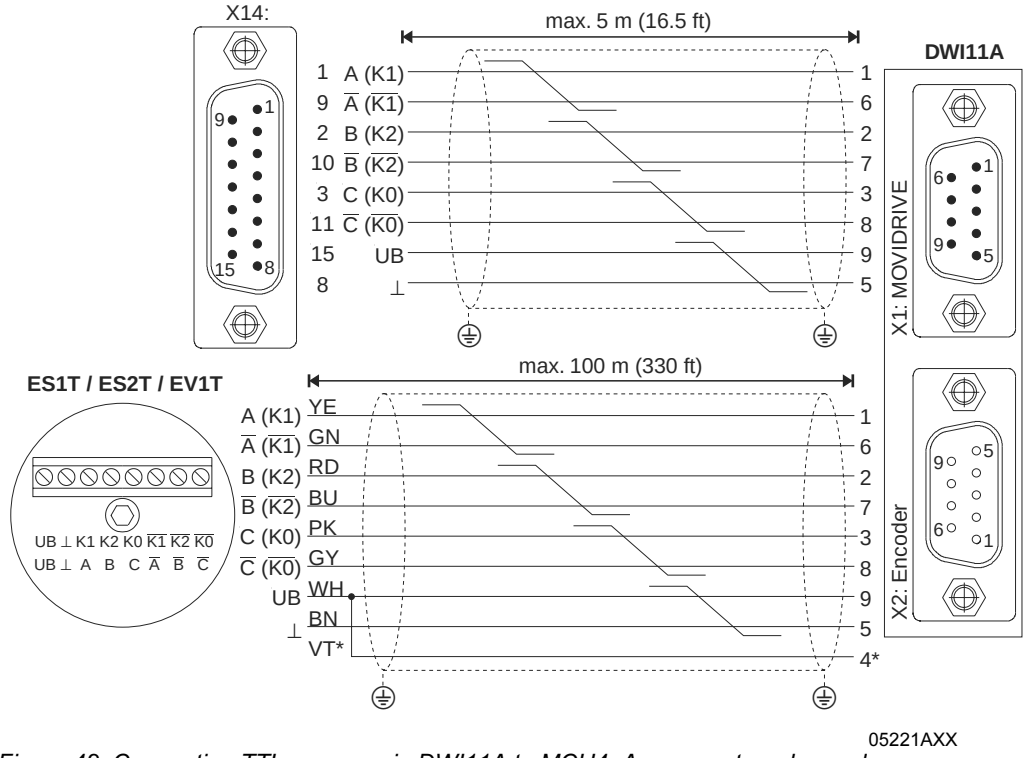


Figure 42: Connecting TTL sensors via DWI11A to MCH4_A as an external encoder

* Connect the sensor line (VT) on the encoder to UB, do not jumper on the DWI11A!

Part numbers of the pre-fabricated cables:

- Encoder ES1T / ES2T / EV1T → DWI11A X2:Encoder
  - For fixed routing: 198 829 8
  - For cat track routing: 198 828 X

Incremental encoder simulation

You can also use X14: as an incremental encoder simulation output. To do this, you must jumper 'switchover' (X14:7) with DGND (X14:8). X14: then supplies incremental encoder signals with a signal level according to RS-422 (5 V TTL). The number of pulses is as follows:

- With MCH4_A with Hiperface encoder 1024 pulses/revolution
- With MCH4_A with sin/cos encoder or TTL sensor as on X15: Input motor encoder

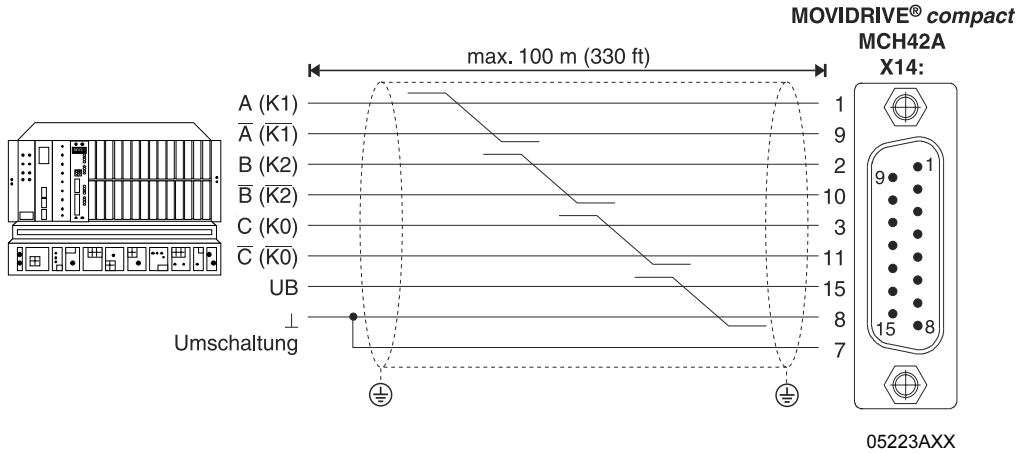


Figure 43: Incremental encoder simulation connection to MCH4_A

Master/slave connection

X14-X14 connection (= master/slave connection) of two MOVIDRIVE® *compact* units.

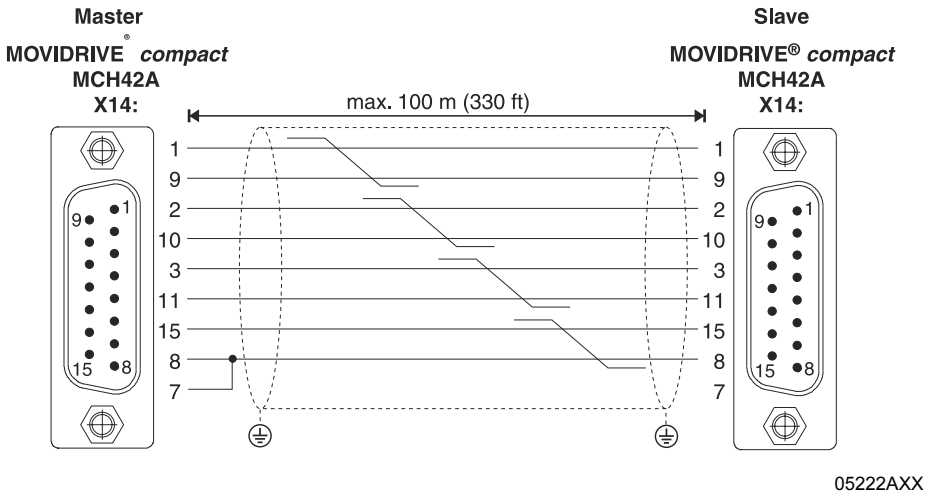


Figure 44: X14-X14 connection MCH4_A

5 Startup

5.1 General startup instructions

It is essential to comply with the safety notes during startup!

Prerequisite

Correct project planning of the drive is the prerequisite for successful startup. Refer to the MOVIDRIVE® *compact* System Manual for detailed project planning instructions and an explanation of the parameters (chapters 4 and 5).

VFC operating modes without speed control

MOVIDRIVE® *compact* drive inverters are factory set to be taken into operation with the SEW motor (MC_4_A...-5_3: 4-pole and rated voltage 3 × 400 V_{AC} / 50 Hz or MC_4_A...-2_3: 4-pole and rated voltage 3 × 230 V_{AC} / 60 Hz) which is adapted to the correct power level. The motor can be connected and the drive started immediately in accordance with Sec. 'Starting the motor' (→ page 58).

Inverter/motor combinations

The following tables indicate the applicable inverter/motor combinations.

400/500 V units

MOVIDRIVE® *compact* MCF4_A or MCV/MCH4_A in VFC mode	SEW motor
0015-5A3-4	DT90L4
0022-5A3-4	DV100M4
0030-5A3-4	DV100L4
0040-5A3-4	DV112M4
0055-5A3-4	DV132S4
0075-5A3-4	DV132M4
0110-5A3-4	DV160M4
0150-503-4	DV160L4
0220-503-4	DV180L4
0300-503-4	DV200L4
0370-503-4	DV225S4
0450-503-4	DV225M4
0550-503-4	D250M4
0750-503-4	D280S4

230 V units

MOVIDRIVE® *compact* MCF4_A or MCV/MCH4_A in VFC mode	SEW motor
0015-2A3-4	DT90L4
0022-2A3-4	DV100M4
0037-2A3-4	DV100L4
0055-2A3-4	DV132S4
0075-2A3-4	DV132M4
0110-203-4	DV160M4
0150-203-4	DV180M4
0220-203-4	DV180L4
0300-203-4	DV225S4

The startup functions described in this section are used for setting the inverter so it is optimally adapted to the motor which is actually connected and to the given operating conditions. It is essential to perform a startup as described in this section for the VFC operating modes with speed control, all CFC operating modes and SERVO operating modes.

Hoist applications

Do not use MOVIDRIVE® *compact* drive inverters for any safety functions in connection with hoist applications.

Use monitoring systems or mechanical protection devices as safety features in order to avoid possible damage to property or injury to people.

5.2 Preliminary work and resources

- Check the installation.
- Take suitable measures to prevent the motor starting up inadvertently. Furthermore, additional safety precautions must be taken depending on the application in order to avoid endangering people and machinery.

  Suitable measures are:

  – With MCF/MCV/MCS4_A: Connect terminal X10:9 '/CONTROL. INHIBIT' to DGND.
  – With MCH4_A: Disconnect the electronics terminal block X11.
- For **startup with the DBG11B keypad**:

  Connect the DBG11B keypad to the TERMINAL option slot.
- For **startup with a PC and MOVITOOLS**:

  Connect the USS21A option to the TERMINAL option slot and use an interface cable (RS-232) to connect it to the PC. MOVIDRIVE® and the PC must be de-energized when you do this, otherwise undefined states may be adopted. Then switch on both units. Install MOVITOOLS on the PC if you have not already done so. Start the program.
- Switch on the power supply and the 24 V supply, if necessary.

  If you are using the DBG11B keypad, the following message appears for about 13 s:

SELFTEST
MOVIDRIVE

- Undertake the correct preliminary parameter setting (e.g. factory setting).
- Check the set terminal assignment (→ P60_).

Startup **automatically changes a group of parameter values**. The parameter description P700 'Operating modes' explains which parameters are affected by this step. Refer to the MOVIDRIVE® *compact* System Manual, Sec. 4 'Parameters', for a **parameter description**.

5.3 Startup with the DBG11B keypad

General information

Startup with the DBG11B keypad is **possible with MCF and MCV/MCH in VFC operating modes only**. Startup in CFC and SERVO operating modes is possible using the MOVITOOLS software only.

Data required

The following data are required for successful startup:

- Motor type (SEW motor or non-SEW motor)
- Motor data
  - Rated voltage and rated frequency.
  - In addition, with a non-SEW motor: Rated current, rated power, power factor cosφ and rated speed.
- Power supply voltage

The following information is also required for startup of the speed controller:

- Incremental encoder type
- Encoder type and resolution of the incremental encoder:

SEW encoder type	Startup parameters	
	Encoder type	Encoder resolution
AS1H, ES1H, AV1H	HIPERFACE	1024
ES1S, ES2S, EV1	SINE ENCODER	1024
ES1R, ES2R, EV1R ES1T[1)]**, ES2T**[1)]**, EV1T**[1)]	INCREM. TTL SENSOR	1024

1) 5 V TTL sensors ES1T, ES2T and EV1T must be connected via the DWI11A option (→ Sec. Installation).

- Motor data
  - SEW motor: Brake yes or no and flywheel fan (Z fan) yes or no
  - Non-SEW motor: Mass moment of inertia [10^{-4}kgm^2] of the motor, brake and fan
- Stiffness of the closed-loop control system (factory setting = 1; can be used as an initial value in most applications)

  If the drive tends to vibrate → setting < 1

  If the transient recovery time is too long → setting > 1

  Setting range for most applications: 0.70...1...1.40
- Mass moment of inertia [10^{-4}kgm^2] of the load (gear unit + driven machine) extrapolated for the motor shaft. If the mass moment of inertia of the load cannot be determined → use 1 to 20 times the value of the mass moment of inertia of the motor.
- Time for the shortest ramp required.

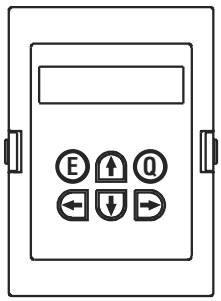
If you are using a TTL sensor (encoder type INCREM. TTL SENSOR), a sin/cos encoder (encoder type SINE ENCODER) or a Hiperface encoder (encoder type HIPERFACE):

- Activate encoder monitoring (P504 = 'ON') after completing the startup. The function and voltage supply of the encoder are then monitored.

Important: Encoder monitoring is not a safety function!

Startup functions of the DBG11B

Detailed description of the keypad → Sec. 'Operating displays':



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← and → at the same time	Commence startup.
↑ key	Next menu command or increase value in edit mode.
↓ key	Previous menu command or decrease value in edit mode.
→ key	One menu level down or activate edit mode for the menu command.
← key	One menu level up or deactivate edit mode for the menu command.
Q key	Cancel startup and return to main display.
E key	Cancel startup and return to main display.

Language selection on DBG11B keypad

- The main display of the keypad is in German.

```
REGLERSPERRE
STROM:          0  A
```

- Press the ↓ key twice to display parameter group 8...

```
8..   GERAETE-
      FUNKTIONEN
```

- Press the → key twice and the ↑ key once to display parameter 801 'Language'. Press the → key to activate edit mode. Press the ↓ or ↑ key to select the language you want and then press the ← key to exit edit mode.

```
801   GERMAN
      LANGUAGE
```

- Press the Q key to return to the main display.

Structure of the startup menu

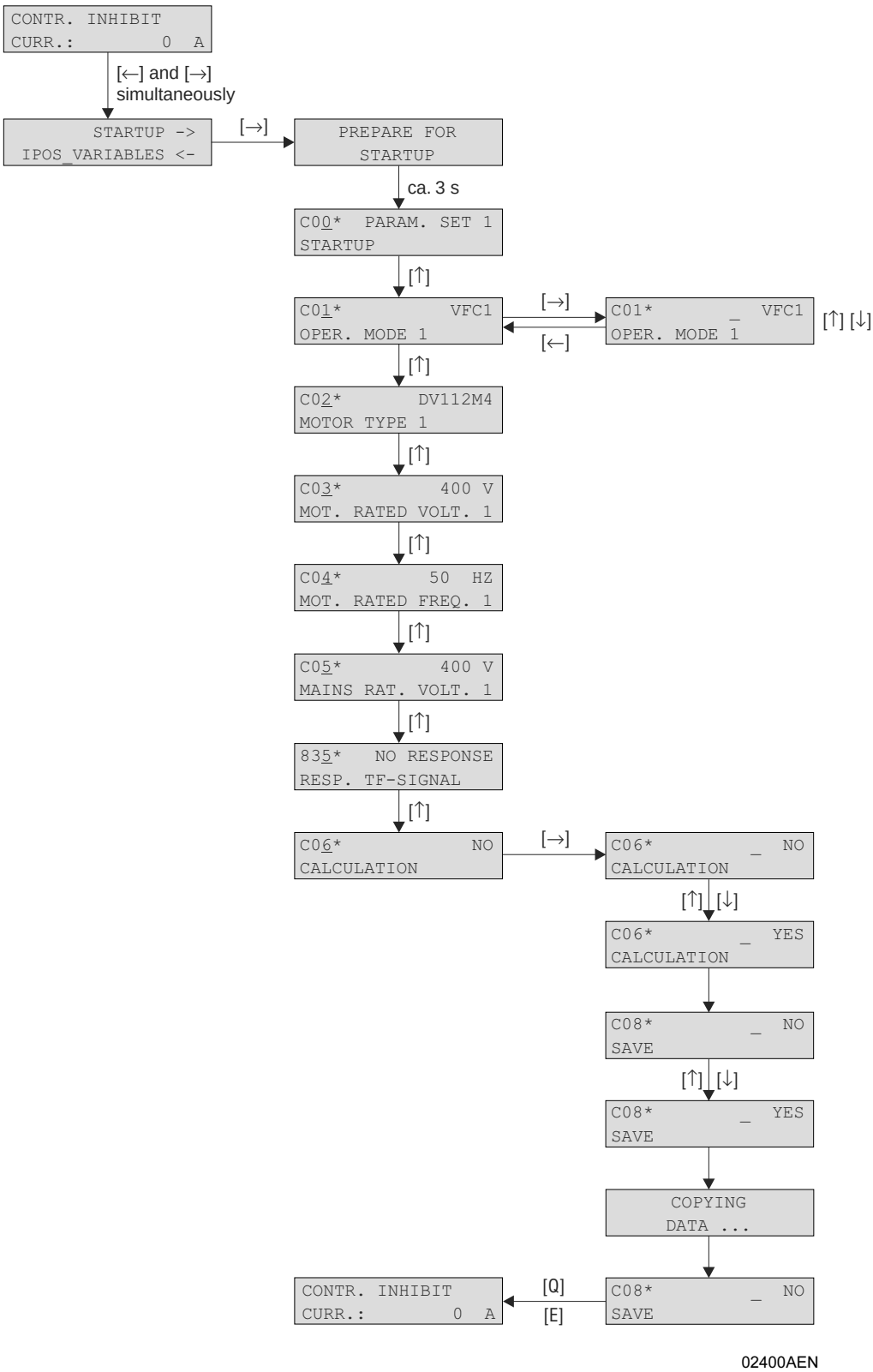

Figure 45: Structure of the startup menu

Startup procedure

1. '0' signal at terminal DIØØ '/CONTROLLER INHIBIT'.

```
CONTROL.INHIBIT
CURRENT:       0 A
```

2. Activate the startup menu by pressing the ← and → keys on the DBG11B at the same time.

```
     STARTUP →
IPOS_VARIABLES ←
```

3. Press the → key to commence the startup. The first window of the startup menu appears. The menu commands are identified by an * in the 4th position. Menu commands which only appear in the startup menu start with 'C', the other menu commands have the number in the parameter list (page 62). Press the ↑ key to jump to the next menu command when you have worked through a menu command.

```
   STARTUP IS
BEING PREPARED
```

4. Select a parameter set, e.g. parameter set 1.

```
C00*  PARAM. SET 1
STARTUP
```

5. Set the operating mode, e.g. VFC1.

```
C01*           VFC1
OPER. MODE 1
```

6. Select the connected motor. If a 2 or 4-pole SEW motor is connected, select the correct motor from the list. In the case of a non-SEW motor or an SEW motor with more than four poles, choose 'NON-SEW MOTOR' in the selection list.

```
C02*        DV112M4
MOT. TYPE 1
```

```
C02*     NON-SEW
MOT.
MOT. TYPE 1
```

7. Refer to the nameplate of the motor and enter the rated motor voltage for the selected connection type.

```
C03*        400   V
RATED MOT. VOLT. 1
```

   Example: Nameplate 230Δ/400 ⅄ 50 Hz
   ⅄ connection → Enter 400 V.
   Δ connection, transition point at 50 Hz → Enter 230 V.
   Δ connection, transition point at 87 Hz → Also enter 230 V, however after startup first set parameter P302 'MAXIMUM SPEED 1' to the value for 87 Hz and then start the drive.

   Example: Nameplate 400Δ/690 ⅄ 50 Hz
   Only Δ connection possible → Enter 400 V.
   ⅄ connection is not possible.

8. Enter the rated frequency specified on the motor nameplate.
   Example: 230Δ/400 ⅄ 50 Hz
   Enter 50 Hz in a ⅄ and Δ connection.

```
C04*        50    Hz
RATED MOT. FREQ. 1
```

WITH SEW MOTORS

9. The motor values are stored for SEW 2 and 4-pole motors and do not have to be entered.

WITH NON-SEW MOTORS

9. Enter the following data from the motor nameplate:
   - Rated motor current, note the connection type (⅄ or Δ).
   - Rated power of the motor
   - Power factor cos φ
   - Rated speed of the motor

10. Enter the rated voltage of the supply system

```
C05*        400   V
RATED SYS. VOLT. 1
```

11. If no TF/TH is connected → Set 'NO RESP.'. Set the required fault response if a TF/TH is connected.

```
835*  NO RESP.
RESP. TF sensor SIG-
NAL
```

12. Commence the startup calculation by selecting 'YES'.

```
C06*        NO
CALCULATION
```

WITH SEW MOTORS

13. The calculation is performed.

WITH NON-SEW MOTORS

13. The calculation for non-SEW motors requires a calibration procedure:
    - When prompted, give a '1' signal on terminal DIØØ '/CONTROL.INHIBIT'.
    - Give a '0' signal on terminal DIØØ '/CONTROL.INHIBIT' again after the calibration is complete.
    - The motor parameters are estimated if it is not possible to calibrate (energize) the motor.

14. The 'SAVE' menu command appears automatically. The keypad is already in edit mode.

```
C08*        _NO
SAVE
```

15. Set 'SAVE' to 'YES'. The data (motor parameters) are copied into the non-volatile memory of MOVIDRIVE®.

```
  DATA ARE BEING
    COPIED...
```

16. This completes the startup. Press the E or Q key to exit the startup menu. The main display then appears.

```
CONTROL.INHIBIT
CURRENT:    0  A
```

- Copy the parameter set from MOVIDRIVE® into the DBG11B keypad after completing the startup (P807 'MDX → DBG'). In this way, it is possible to use the DBG11B to transfer the parameter set to other MOVIDRIVE® units (P 806 'DBG → MDX').
- Enter any parameter settings which differ from the factory settings in the parameter list (→ page 62).
- In the case of non-SEW motors, set the correct brake reaction time (P732 / P735).
- Refer to the information in Sec. 'Starting the motor' (→ page 58) for starting the motor.
- With Δ connection and transition point at 87 Hz → Set parameter P302/312 'Maximum speed 1/2' to the value for 87 Hz.

Startup of speed controller

Startup is performed without the speed controller first.

Important: Set VFC-n-CONTROL operating mode.

```
C01*  VFC-n-CTRL.
OPER. MODE 1
```

Structure

Structure of the startup menu for the speed controller:

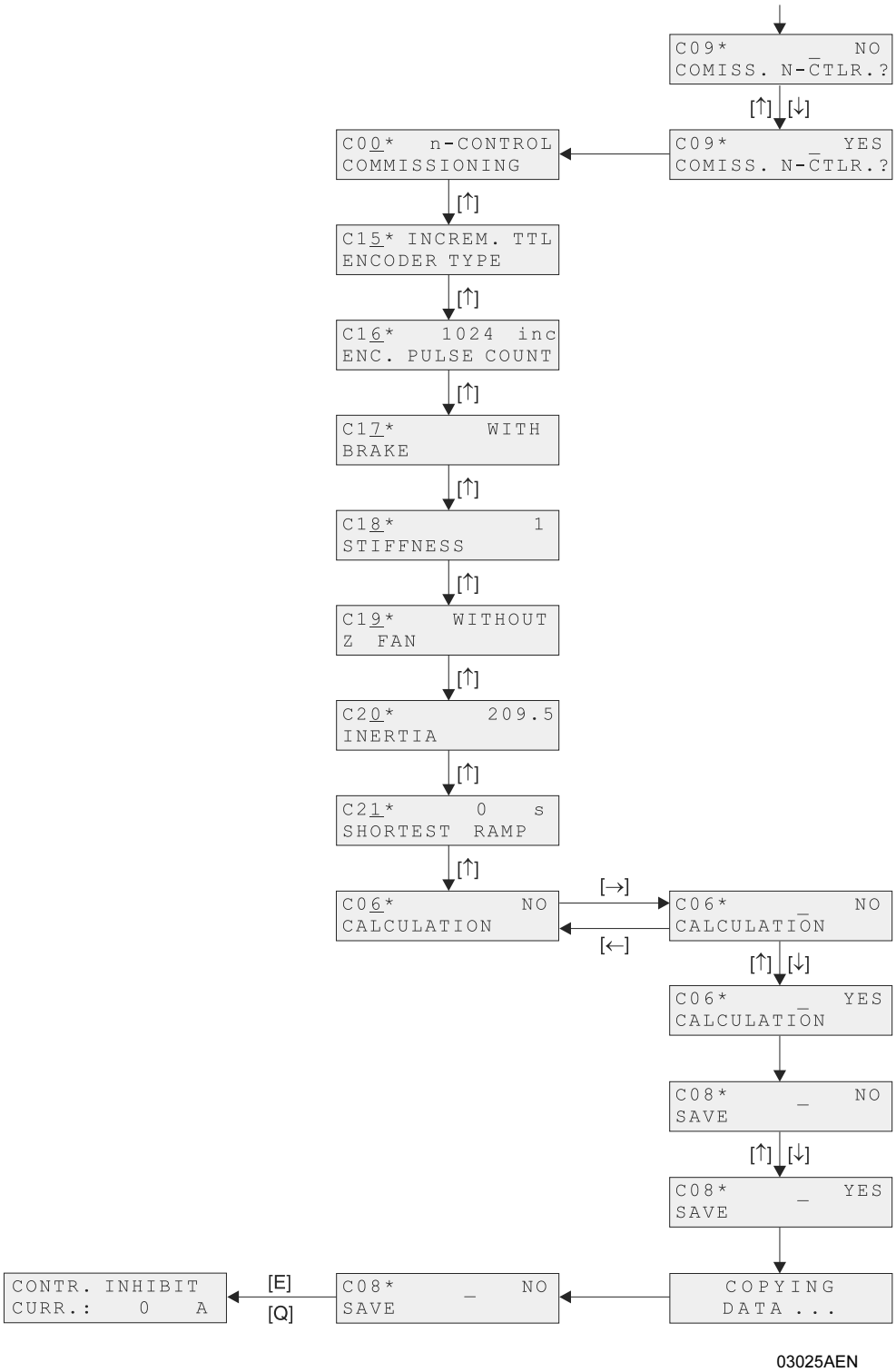

Figure 46: Structure of startup with the speed controller

Startup procedure

1. Press 'YES' to commence the speed controller startup. All mass moments of inertia must be entered in the unit [10^{-4} kgm^2].
2. Press the ↑ key to move on to the next menu item each time.
3. Enter the correct encoder type.
4. Enter the correct encoder resolution.

WITH SEW MOTORS

5. Enter whether the motor has a brake.
6. Set the stiffness of the closed-loop control system.
7. Enter whether the motor has a flywheel fan (Z fan).

WITH NON-SEW MOTORS

5. Enter the moment of inertia of the motor.
6. Set the stiffness of the closed-loop control system.
7. Set the moment of inertia of the brake and the fan.
8. Enter the mass moment of inertia of the load (gear unit + driven machine) extrapolated for the motor shaft.
9. Enter the time for the shortest ramp you want.
10. Commence the speed controller startup calculation by selecting 'YES'.
11. The 'SAVE' menu command appears automatically. Set 'SAVE' to 'YES'. The data are copied into the non-volatile memory of MOVIDRIVE®.
12. The 'SAVE' menu command appears again. Press the E or Q key to exit the startup menu. The main display then appears.

- Copy the parameter set from MOVIDRIVE® into the DBG11B keypad after completing the startup (P807 'MDX → DBG'). In this way, it is possible to use the DBG11B to transfer the parameter set to other MOVIDRIVE® units (P 806 'DBG → MDX').
- Enter any parameter settings which differ from the factory settings in the parameter list (→ page 62).
- In the case of non-SEW motors, set the correct brake reaction time (P732 / P735).
- Refer to the information in Sec. 'Starting the motor' (→ page 58) for starting the motor.
- With Δ connection and transition point at 87 Hz → Set parameter P302/312 'Maximum speed 1/2' to the value for 87 Hz.
- Activate encoder monitoring for TTL sensors, sin/cos and Hiperface encoders (P504='ON'). **Encoder monitoring is not a safety function.**

5.4 Startup with a PC and MOVITOOLS

General information

- Terminal DIØØ '/CONTROL.INHIBIT' must get a '0' signal!
- Start the MOVITOOLS program.
- Set the language.
- Select the PC port (PC COM) to which the inverter is connected.
- Select <Update> to display the connected inverter.

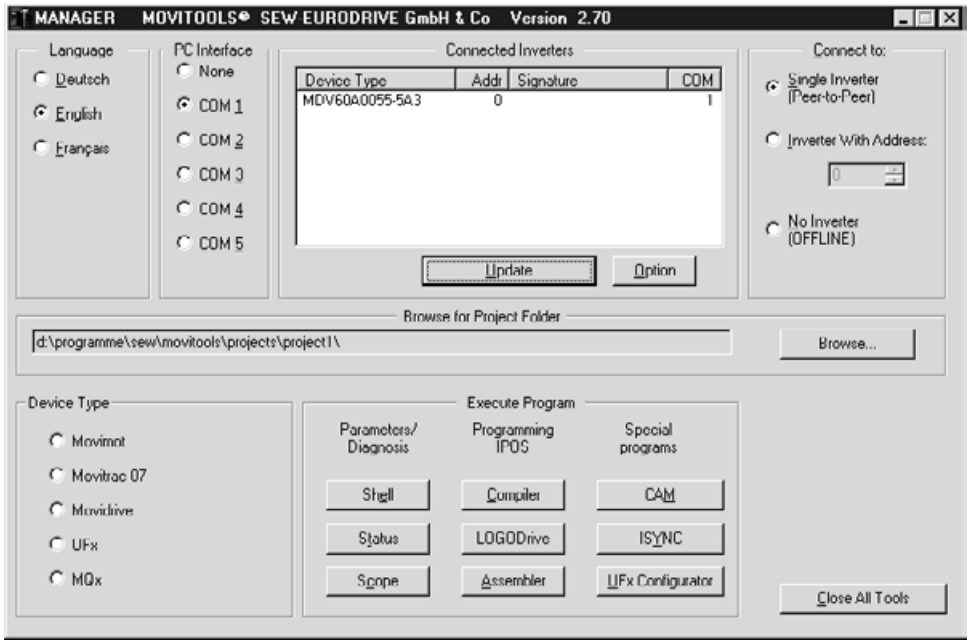

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Figure 47: MOVITOOLS startup window

Commencing startup

- Click on <Shell> in 'Execute Program'. The Shell program is started.
- Select the [Startup] / [Startup...] menu command. MOVITOOLS opens the startup menu.
- Select asynchronous or synchronous as the motor type.
- Select the parameter set. With speed-controlled drives, the speed controller can be selected separately when startup is repeated (only possible with parameter set 1).
- Set the operating mode.
- Select SEW motor or non-SEW motor. 2 and 4-pole SEW motors can be selected in VFC operating modes. Only 4-pole SEW motors can be selected in CFC and SERVO operating modes. SEW motors with different numbers of poles must be set as non-SEW motors.
- Enter the motor type data and, if speed control is being used, the speed controller data as well.
- Press <Finish> to complete the startup.
- Make any necessary parameter settings using the main menu or the user menu.
- Save the parameter set. The parameter set can be transferred to other MOVIDRIVE® units.
- Print out the set parameters using [File] / [Print Data].
- Refer to the information in Sec. 'Starting the motor' (→ page 58) for starting the motor.

5.5 Starting the motor

Analog setpoint specification

The following table shows which signals must be present on terminals AI1 and DIØØ...DIØ3 when the 'UNIPOL/FIX.SETPT' setpoint is selected (P100), in order to operate the drive with an analog setpoint entry.

Function	AI11 Analog input n1	DIØØ /Controller inhibit	DIØ1 CW/STOP	DIØ2 CCW/STOP	DIØ3 Enable/rapid stop
Controller inhibit	X	'0'	X	X	X
Rapid stop	X	'1'	X	X	'0'
Enable and stop	X	'1'	'0'	'0'	'1'
Clockwise at 50 % n_{max}	5 V	'1'	'1'	'0'	'1'
Clockwise at n_{max}	10 V	'1'	'1'	'0'	'1'
Counterclockwise at 50 % n_{max}	5 V	'1'	'0'	'1'	'1'
Counterclockwise at n_{max}	10 V	'1'	'0'	'1'	'1'

The following travel cycle shows by way of example how the motor is started with the wiring of terminals DIØØ...DIØ3 and analog setpoints. Binary output DBØØ '/Brake' is used for switching brake contactor K12.

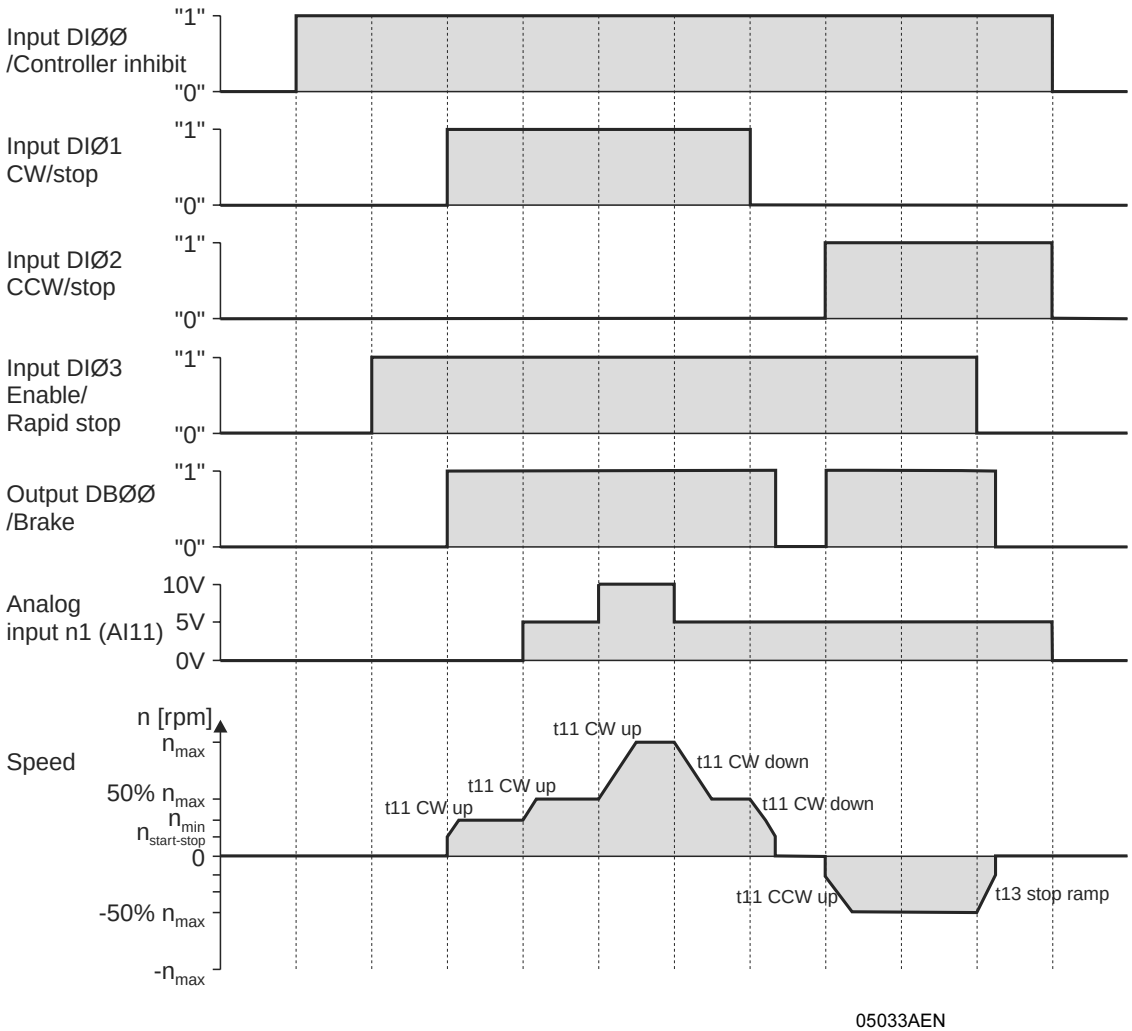


Figure 48: Travel cycle with analog setpoints

The motor is not energized in the event of controller inhibit (DIØØ = '0'). A motor without a brake then coasts to a halt.

Fixed setpoints The following table shows which signals must be present on terminals DIØØ...DIØ5 when the 'UNIPOL/FIX.SETPT' setpoint is selected (P100) to operate the drive with the fixed setpoints.

Function	DIØØ /Controller inhibit	DIØ1 CW/STOP	DIØ2 CCW/STOP	DIØ3 Enable/rapid stop	DIØ4 n11/n21	DIØ5 n12/n22
Controller inhibit	'0'	X	X	X	X	X
Rapid stop	'1'	X	X	'0'	X	X
Enable and stop	'1'	'0'	'0'	'1'	X	X
Clockwise at n11	'1'	'1'	'0'	'1'	'1'	'0'
Clockwise at n12	'1'	'1'	'0'	'1'	'0'	'1'
Clockwise at n13	'1'	'1'	'0'	'1'	'1'	'1'
Counterclockwise at n11	'1'	'0'	'1'	'1'	'1'	'0'

The following travel cycle shows by way of example how the drive is started with the wiring of terminals DIØØ...DIØ5 and the internal fixed setpoints. Binary output X10:3 (DBØØ '/Brake') is used for switching brake contactor K12.

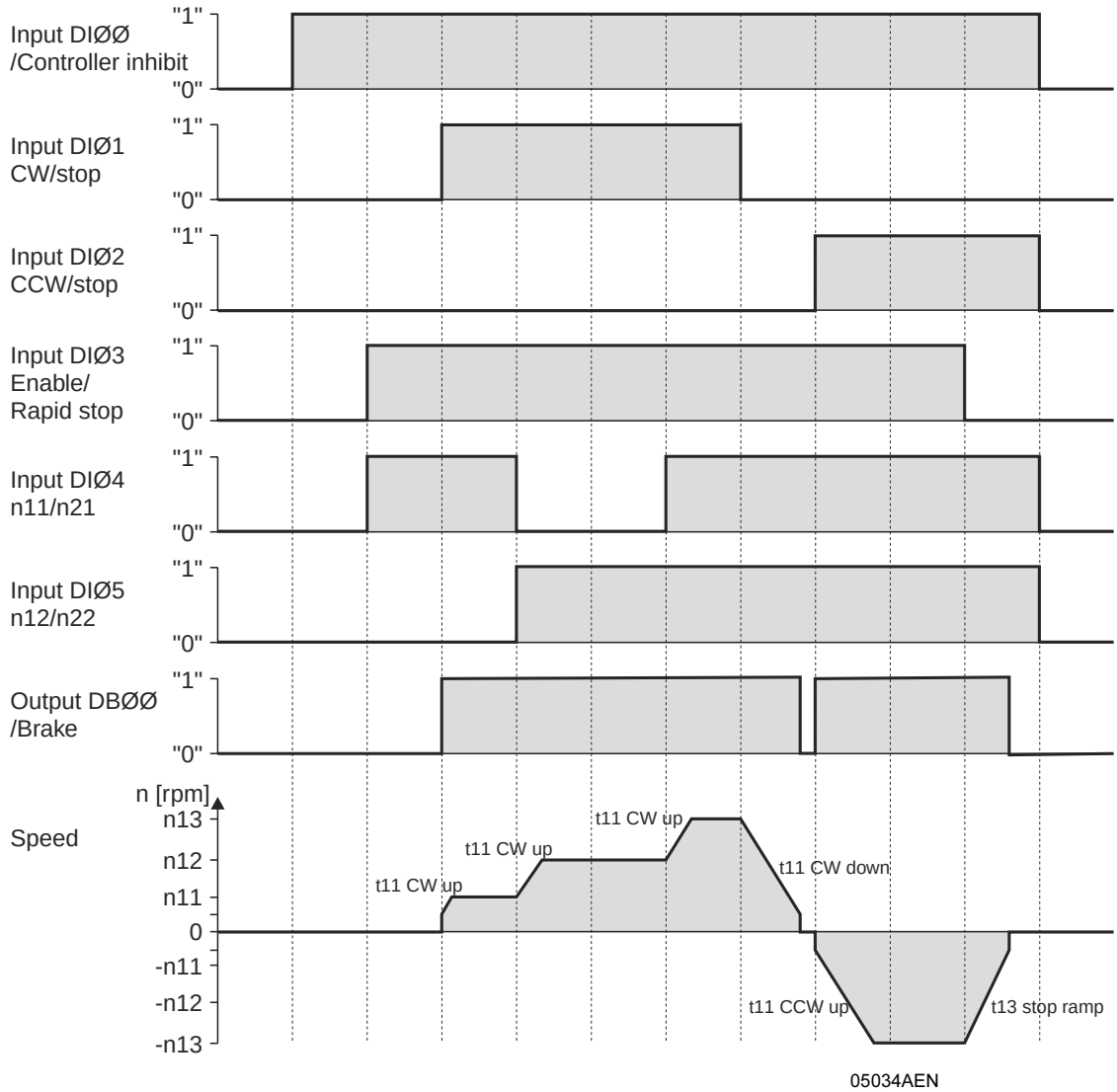


Figure 49: Travel cycle with internal fixed setpoints

The motor is not energized in the event of controller inhibit (DIØØ = '0'). A motor without a brake then coasts to a halt.

Manual operation

The inverter can be controlled using the DBG11B keypad with the manual operation function. The inverter must be in 'No enable' status to start manual operation. 'No enable' status means DIØØ /Controller inhibit = '1' and binary inputs DIØ1 CW/STOP, DIØ2 CCW/STOP and DIØ3 Enable/Rapid stop = '0' which are programmed in the factory settings.

Binary input DIØØ /Controller inhibit is also effective in manual operation. The other binary inputs are ineffective during manual operation. Binary input DIØØ '/Controller inhibit' must get a '1' signal to start the drive in manual operation. The drive can also be stopped in manual operation by DIØØ = '0'. The direction of rotation is not determined by the 'CW/stop' or 'CCW/stop' binary inputs. Instead, you select the direction of rotation using the keypad (→ Figure 50).

Manual operation remains active even after the supply system power has been switched off/on. The inverter is then inhibited, however. A change of direction command using the → or ← key produces an enable and a start in the selected sense of rotation at n_{min}. The speed is increased and decreased using the ↑ and ↓ keys. The modification speed is 150 rpm per second.

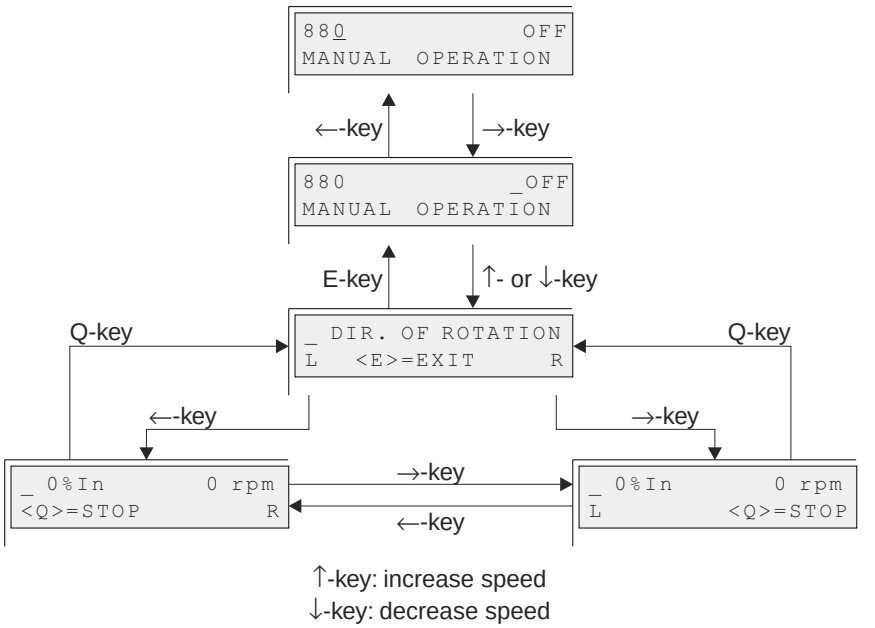


Figure 50: Manual mode with DBG11B

The signals at the binary inputs take effect as soon as manual operation is finished. Binary input DIØØ '/Controller inhibit' does not have to be switched from '1' to '0' and back to '1'. The drive can start according to the signals at the binary inputs and the setpoint sources.

Note that the binary inputs DIØ1 CW/STOP, DIØ2 CCW/STOP and DIØ3 Enable/Rapid stop which are programmed in the factory settings receive a '0' signal when you end manual operation.

5.6 Startup for positioning tasks (MCH4_A)

A Hiperface encoder connected to the MOVIDRIVE® *compact* MCH4_A provides absolute position values and is a suitable device for positioning tasks. This statement holds true for connection as motor encoder to X15 and as external encoder to X14.

A single reference travel is required to set up the absolute position.

Positioning with the Hiperface encoder as motor encoder

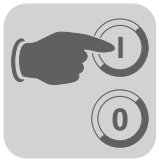
The motor encoder can be used for positioning tasks for slip-free applications, i.e. a positive connection between drive and driven machine. Proceed as follows:

- Set parameter P941 "Source Actual Position = Motor Encoder (X15)."
- Set parameter P900 "Reference Offset." The following formula applies: machine zero = reference point + reference offset.
- Set the reference travel parameters P901, P902, P903 and P904 according to your application.
- Execute a reference travel. The reference travel can take place in two ways:
  - Go to the manual operation menu in the MOVITOOLS operating software and start the function "Reference travel."
  - Writ an IPOS program for the reference travel and start this program.

Positioning with the Hiperface encocer as external encoder

Use an external encoder for positioning in case of slip-prone applications, i.e. non-positive connection between drive and driven machine. Proceed as follows:

- Connect the Hiperface encoder to X14.
- Set the parameter P900 "Reference offset." The following formula applies: machine zero = reference point + reference offset.
- Set the parameter P941 "Source Actual Position = Ext. Encoder (X14)."
- Set the reference travel parameters P901, P902, P903 and P904 according to your application.
- Set parameter P945 "Synchronous encoder type (X14) = Hiperface."
- Execute a reference travel.



5.7 Complete parameter list

The parameters of the short menu are identified by a '/' (= displayed on the DBG11B keypad).

Par.	Name	Value range
DISPLAY VALUES		
00_	**Process values**	
000	Speed	-5000...0...5000 rpm
001/	User display	[Text]
002	Frequency	0...400 Hz
003	Actual position	$0...2^{31}$-1 inc
004	Output current	0...200 % I_N
005	Active current	-200...0...200 % I_N
006/	Motor utilization 1	0...200 %
007	Motor utilization 2	0...200 %
008	DC link voltage	0...1000 V
009	Output current	A
01_	**Status displays**	
010	Inverter status	
011	Operational status	
012	Fault status	
013	Active parameter set	1/2
014	Heat sink temperature	-20...0...100 °C
015	Mains ON operation time	0...25000 h
016	Operating time (enabled)	0...25000 h
017	Electrical energy	kWh
02_	**Analog setpoints**	
020	Analog input AI1	-10...0...10 V
021	Analog input AI2	-10...0...10 V
022	External current limit	0...100 %
03_	**Binary inputs basic unit**	
030	Binary input DIØØ	/CONTROL.INHIBIT
031	Binary input DIØ1	
032	Binary input DIØ2	
033	Binary input DIØ3	
034	Binary input DIØ4	
035	Binary input DIØ5	
036/	Status binary inputs basic unit	
05_	**Binary outputs basic unit**	
050	Binary output DBØØ	/BRAKE
051	Binary output DOØ1	
052	Binary output DOØ2	
053/	Status binary outputs basic unit	

Par.	Name	Value range
07_	**Unit data**	
070	Unit type	
071	Rated output current	
076	Firmware basic unit	
077	Technology function	
08_	**Fault memory**	
080/	Fault t-0	
081	Fault t-1	
082	Fault t-2	
083	Fault t-3	
09_	**Bus diagnostics**	
090	PD configuration	
091	Fieldbus type	
092	Fieldbus baud rate	
093	Fieldbus address	
094	PO1 setpoint	
095	PO2 setpoint	
096	PO3 setpoint	
097	PI1 actual value	
098	PI2 actual value	
099	PI3 actual value	

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
1__	**SETPOINTS / RAMP GENERATORS**						
10_	**Setpoint selection**						
100/	Setpoint source	**UNIPOL/FIX.SETPT**					
101	Control signal source	**TERMINALS**					
11_	**Analog input AI1**						
110	AI1 scaling	-10...-0.1 / 0.1...**1**...10					
111	AI1 offset	-500...**0**...500 mV					
112	AI1 operation mode	**Ref. N-MAX**					
113	AI1 voltage offset	-10...**0**...10 V					
114	AI1 speed offset	-5000...**0**...5000 rpm					
115	Filter setpoint	0...**5**...100 ms 0 = Filter off					
12_	**Analog input AI2**						
120	AI2 operation mode	**NO FUNCTION**					
13_	**Speed ramps 1**			**14_**	**Speed ramps 2**		
130/	Ramp t11 UP CW	0...**2**...2000 s		140	Ramp t21 UP CW	0...**2**...2000 s	
131/	Ramp t11 DOWN CW	0...**2**...2000 s		141	Ramp t21 DOWN CW	0...**2**...2000 s	
132/	Ramp t11 UP CCW	0...**2**...2000 s		142	Ramp t21 UP CCW	0...**2**...2000 s	
133/	Ramp t11 DOWN CCW	0...**2**...2000 s		143	Ramp t21 DOWN CCW	0...**2**...2000 s	
134/	Ramp t12 UP=DOWN	0...**2**...2000 s		144	Ramp t22 UP=DOWN	0...**2**...2000 s	
135	S pattern t12	**0**...3		145	S pattern t22	**0**...3	
136/	Stop ramp t13	0...**2**...20 s		146	Stop ramp t23	0...**2**...20 s	
137/	Emergency ramp t14	0...**2**...20 s		147	Emergency ramp t24	0...**2**...20 s	
15_	**Motorized potentiometer (parameter set 1 and 2)**						
150	Ramp t3 UP	0.2...**20**...50 s					
151	Ramp t3 DOWN	0.2...**20**...50 s					
152	Save last setpoint	ON / **OFF**					
16_	**Fixed setpoints 1**			**17_**	**Fixed setpoints 2**		
160/	Internal setpoint n11	-5000...0...**150**...5000 rpm		170	Internal setpoint n21	-5000...0...**150**...5000 rpm	
161/	Internal setpoint n12	-5000...0...**750**...5000 rpm		171	Internal setpoint n22	-5000...0...**750**...5000 rpm	
162/	Internal setpoint n13	-5000...0...**1500**...5000 rpm		172	Internal setpoint n23	-5000...0...**1500**...5000 rpm	
2__	**CONTROLLER PARAMETERS**						
20_	**Speed control (parameter set 1 only)**						
200	P-gain speed controller	0.1...**2**...32					
201	Time constant n-control.	0...**10**...300 ms					
202	Gain accel. feedforward	**0**...32					
203	Filter accel. feedforward	**0**...100 ms					
204	Filter speed actual value	**0**...32 ms					
205	Load feedforward	**0**...150 %					
206	Sample time n-control.	**1 ms = 0** / 0.5 ms = 1					
207	Load feedforward VFC	**0**...150 %					
21_	**Hold controller**						
210	P gain hold controller	0.1...**2**...32					
22_	**Synchr. oper. control (only parameter set 1)**						
228	Feedforward filter (DRS)	**0**...100 ms		Only with MOVITOOLS. Not visible on the DBG11B keypad.			

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
3__	**MOTOR PARAMETERS**						
30_	**Limits 1**			**31_**	**Limits 2**		
300/	Start/stop speed 1	0...**60**...150 rpm		310	Start/stop speed 2	0...**60**...150 rpm	
301/	Minimum speed 1	0...**60**...5500 rpm		311	Minimum speed 2	0...**60**...5500 rpm	
302/	Maximum speed 1	0...**1500**...5500 rpm		312	Maximum speed 2	0...**1500**...5500 rpm	
303/	Current limit 1	0...**150** %I_N		313	Current limit 2	0...**150** %I_N	
304	Torque limit	**0**...150 %					
32_	**Motor compensat. 1 (asynchr.)**			**33_**	**Motor compensat. 2 (asynchr.)**		
320/	Automatic adjustment 1	**ON** / OFF		330	Automatic adjustment 2	**ON** / OFF	
321	Boost 1	**0**...100 %		331	Boost 2	**0**...100 %	
322	IxR compensation 1	**0**...100 %		332	IxR compensation 2	**0**...100 %	
323	Premagnetizing time 1	0...**0.1**...2 s		333	Premagnetizing time 2	0...**0.1**...2 s	
324	Slip compensation 1	**0**...500 rpm		334	Slip compensation 2	**0**...500 rpm	
34_	**Motor protection**						
340	Motor protection 1	ON / **OFF**		342	Motor protection 2	ON / **OFF**	
341	Cooling type 1	**FAN COOLED** / FORCED COOLING		343	Cooling type 2	**FAN COOLED** / FORCED COOLING	
35_	**Motor sense of rotation**						
350	Change direction of rotation 1	ON / **OFF**		351	Change direction of rotation 2	ON / **OFF**	
360	Startup	YES / **NO**		Only available in DBG11B, not in MOVITOOLS/SHELL!			
4__	**REFERENCE SIGNALS**						
40_	**Speed reference signal**						
400	Speed reference value	0...**1500**...5000 rpm					
401	Hysteresis	0...**100**...500 rpm					
402	Delay time	0...**1**...9 s					
403	Signal = '1' if:	**n < n_{ref}** / n > n_{ref}					
41_	**Speed window signal**						
410	Window center	0...**1500**...5000 rpm					
411	Range width	**0**...5000 rpm					
412	Delay time	0...**1**...9 s					
413	Signal = '1' if:	**INSIDE** / OUTSIDE					
42_	**Speed setp./act. val. comp.**						
420	Hysteresis	1...**100**...300 rpm					
421	Delay time	0...**1**...9 s					
422	Signal = '1' if:	**n <> n_{setpt}** / n = n_{setpt}					
43_	**Current reference signal**						
430	Current reference value	0...**100**...150 % I_N					
431	Hysteresis	0...**5**...30 % I_N					
432	Delay time	0...**1**...9 s					
433	Signal = '1' if:	**I < I_{ref}** / I > I_{ref}					
44_	**Imax signal**						
440	Hysteresis	0...**5**...50 % I_N					
441	Delay time	0...**1**...9 s					
442	Signal = '1' if:	I = I_{max} / **I < I_{max}**					

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
5__	**MONITORING FUNCTIONS**						
50_	**Speed monitoring**						
500	Speed monitoring 1	**OFF** / MOTOR MODE / REGENERAT. MODE / MOT.& REGEN.MODE		502	Speed monitoring 2	**OFF** / MOTOR MODE / REGENERAT. MODE / MOT.& REGEN.MODE	
501	Delay time 1	0...**1**...10 s		503	Delay time 2	0...**1**...10 s	
504	Encoder monitoring	ON / **OFF**					
52_	**Mains OFF monitoring**						
520	Mains OFF response time	**0**...5 s					
521	Mains OFF response	**CONTROL.INHIBIT** EMERGENCY STOP					
6__	**TERMINAL ASSIGNMENT**						
60_	**Binary inputs basic unit**						
-	Binary input DIØØ	With fixed assignment: **/CONTROL.INHIBIT**					
600	Binary input DIØ1	**CW/STOP**		The following functions can be programmed: NO FUNCTION • ENABLE/RAP.STOP • CW/STOP • CCW/STOP • n11(n13) • n21(n23) • n12(n13) • n22(n23) • FIX SETPT SW.OV. • PAR. SWITCHOVER • RAMP SWITCHOVER • MOTOR POT UP • MOTOR POT DOWN • /EXT. FAULT • FAULT RESET • /HOLD CONTROL • LIM. SWITCH CW • /LIM. SWITCH CCW • IPOS INPUT • REFERENCE CAM • REF.TRAVEL START • SLAVE FREE RUNN. • SETPOINT HOLD • MAINS ON • DRS SET ZERO PT. • DRS SLAVE START • DRS TEACH IN • DRS MAST.STOPPED		
601	Binary input DIØ2	**CCW/STOP**					
602	Binary input DIØ3	**ENABLE/RAP.STOP**					
603	Binary input DIØ4	**n11/n21**					
604	Binary input DIØ5	**n12/n22**					
62_	**Binary outputs basic unit**			The following signals can be programmed: NO FUNCTION • / FAULT • READY • OUTP. STAGE ON • ROT. FIELD ON • BRAKE RELEASED • BRAKE APPLIED • MOTOR STANDSTILL • PARAMETER SET • SPEED REFERENCE • SPEED WINDOW • SP/ACT.VAL.COMP. • CURR. REFERENCE • Imax-SIGNAL • / MOTOR UTILIZ.1 • /MOTOR UTILIZ.2 • DRS PREWARN. • /DRS LAG ERROR • DRS SLAVE IN POS • IPOS IN POSITION • IPOS REFERENCE • IPOS OUTPUT • /IPOS FAULT		
-	Binary output DBØØ	With fixed assignment: **/BRAKE**					
620	Binary output DOØ1	**READY**					
621	Binary output DOØ2	**NO FUNCTION**					
64_	**Analog output**						
640	Analog output AO1	**ACTUAL SPEED**		The following functions can be programmed: NO FUNCTION • RAMP INPUT • SPEED SETPOINT • ACTUAL SPEED • ACTUAL FREQUENCY • OUTPUT CURRENT • ACTIVE CURRENT • UNIT UTILIZATION • IPOS OUTPUT • RELATED TORQUE			
641	Scaling AO1	-10...0...**1**...10					
642	Operating mode AO1	OFF / **-10...+10V** / 0...20mA / 4...20mA					
7__	**CONTROL FUNCTIONS**						
70_	**Operating modes**						
700	Operating mode 1	**VFC 1** VFC 1 & GROUP VFC 1 & HOIST VFC 1 & DC BRAK. VFC 1 &FLY.START VFC-n-CONTROL VFC-n-CTRL&GROUP VFC-n-CTRL.&HOIST VFC-n-CTRL& IPOS CFC CFC & M-CONTROL CFC & IPOS SERVO SERVO & M-CTRL. SERVO&IPOS		701	Operating mode 2	**VFC 2** VFC 2 & GROUP VFC 2 & HOIST VFC 2 & DC BRAK. VFC 2 &FLY.START	
71_	**Current at standstill**						
710	Standstill current 1	**0**...50 % I_{mot}		711	Standstill current 2	**0**...50 % I_{mot}	

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
72_	**Setpoint stop function**						
720	Setpoint stop function 1	ON / **OFF**		723	Setpoint stop function 2	ON / **OFF**	
721	Stop setpoint 1	0...**30**...500 rpm		724	Stop setpoint 2	0...**30**...500 rpm	
722	Start offset 1	0...**30**...500 rpm		725	Start offset 2	0...**30**...500 rpm	
73_	**Brake function**						
730	Brake function 1	**ON** / OFF		733	Brake function 2	**ON** / OFF	
731	Brake release time 1	**0**...2 s		734	Brake release time 2	**0**...2 s	
732	Brake application time 1	0...**0.2**...2 s		735	Brake application time 2	0...**0.2**...2 s	
74_	**Speed skip**						
740	Skip window center 1	0...**1500**...5000 rpm		742	Skip window center 2	0...**1500**...5000 rpm	
741	Skip width 1	**0**...300 rpm		743	Skip width 2	**0**...300 rpm	
75_	**Master-Slave function**						
750	Slave setpoint	**MASTER-SLAVE OFF** SPEED (RS-485) SPEED (SBus) SPEED 485+SBus) TORQUE (RS-485) TORQUE (SBus) TORQUE(485+SBus) LOAD SHAR (RS-485) / LOAD SHARE (SBus) LOAD S(485+SBus)					
751	Scaling slave setpoint	-10...0...**1**...10					
8__	**UNIT FUNCTIONS**						
80_	**Setup**						
802/	Factory setting	YES / **NO**					
803/	Parameter lock	ON / **OFF**					
804	Reset statistic data	**NO** FAULT MEMORY KWH METER OPERATING HOURS					
800/	Quick menu	**ON** / OFF		These parameters are only available in the DBG11B keypad, not in MOVITOOLS!			
801/	Language	**DE** / EN / FR					
806	Copy DBG→MDX	YES / **NO**					
807	Copy MDX→DBG	YES / **NO**					
81_	**Serial communication**						
810	RS485 address	**0**...99					
811	RS-485 group address	**100**...199					
812	RS485 timeout delay	**0**...650 s					
813	SBus address	**0**...63					
814	SBus group address	**0**...63					
815	SBus timeout delay	0...**0.1**...650 s					
816	SBus baud rate	125/250/**500** / 1000 kbaud					
817	SBus synchronization ID	**0**...1023					
818	CAN synchronization ID	0...**1**...2047					
819	Fieldbus timeout delay	0...**0.5**...650 s					
82_	**Brake operation**						
820/	4-quadrant operation 1	**ON** / OFF		821	4-quadrant operation 2	**ON** / OFF	

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
83_	**Fault response**						
830	Response EXT. FAULT	**EMERG.STOP/FAULT**		The following fault responses can be programmed: NO RESPONSE DISPLAY FAULT IMM. STOP/FAULT EMERG.STOP/ FAULT RAPID STOP/FAULT IMM.STOP/WARNG EMERG.STOP/ WARNG RAPID STOP/WARNG			
831	Response FIELDBUS TIMEOUT	**RAPID STOP/WARNG**					
832	Response MOTOR OVERLOAD	**EMERG.STOP/FAULT**					
833	Response RS485 TIMEOUT	**RAPID STOP/WARNG**					
834	Response DRS LAG ERROR	**EMERG.STOP/FAULT**					
835/	Response TF sensor SIGNAL	**NO RESPONSE**					
836	Response SBus TIMEOUT	**EMERG.STOP/FAULT**					
84_	**Reset response**						
840/	Manual reset	YES / **NO**					
841	Auto reset	ON / **OFF**					
842	Restart time	1...**3**...30 s					
85_	**Scaling speed actual value**						
850	Scaling factor numerator	**1**...65535					
851	Scaling factor denominator	**1**...65535					
852	User dimension	**1 rpm**		Can only be set using MOVITOOLS			
86_	**Modulation**						
860	PWM frequency 1	**4**/8/16 kHz		861	PWM frequency 2	**4**/8/16 kHz	
862	PWM fix 1	ON / **OFF**		863	PWM fix 2	ON / **OFF**	
864	PWM frequency CFC	4/**8**/16 kHz					
87_	**Process data description**						
870	Setpoint description PO1	**CTRL. WORD 1**					
871	Setpoint description PO2	**SPEED**					
872	Setpoint description PO3	**NO FUNCTION**					
873	Actual value description PI1	**STATUS WORD1**					
874	Actual value description PI2	**SPEED**					
875	Actual value description PI3	**OUTPUT CURRENT**					
876	PO data enable	**ON** / OFF					
877	DeviceNet PD configuration	0...**3**...5					
88_	**Manual operation**						
880	Manual operation	ON / **OFF**					

Par.	Name Variable par. Parameter set 1	Setting range Factory setting	After startup	Par.	Name Parameter set 2	Setting range Factory setting	After startup
9__	**IPOS PARAMETERS**						
90_	**IPOS Reference travel**						
900	Reference offset	-2^{31}...**0**...2^{31}-1 inc					
901	Reference speed 1	0...**200**...5000 rpm					
902	Reference speed 2	0...**50**...5000 rpm					
903	Reference travel type	**0**...7					
904	Reference travel to zero pulse	**Yes** / No					
91_	**IPOS Travel parameter**						
910	Gain X controller	0.1...**0.5**...32					
911	Positioning ramp 1	0...**1**...20 s					
912	Positioning ramp 2	0...**1**...20 s					
913	Travel speed CW	0...**1500**...5000 rpm					
914	Travel speed CCW	0...**1500**...5000 rpm					
915	Speed feedforward	- 199.99...0...**100**...199.9 9 %					
916	Ramp type	**LINEAR** / SINE / SQUARED / BUSRAMP					
92_	**IPOS Monitoring**						
920	SW limit switch CW	-2^{31}...**0**...2^{31}-1 inc					
921	SW limit switch CCW	-2^{31}...**0**...2^{31}-1 inc					
922	Position window	0...**50**...32767 inc					
923	Lag error window	**0**...2^{31}-1 inc					
93_	**IPOS Special functions**						
930	Override	ON / **OFF**					
931	CTRL word Task 1	START / **STOP**		Only available in DBG11B, not in MOVITOOLS/SHELL!			
932	CTRL word Task 2	START / **STOP**		Only available in DBG11B, not in MOVITOOLS/SHELL! Display parameter, cannot be edited using DBG11B.			
94_	**IPOS Variables/Encoder**						
940	IPOS variables edit	ON / **OFF**		This parameter is only available in the DBG11B keypad, not in MOVITOOLS!			
941	Source actual position	**MOTOR ENC. (X15)** EXTERN.ENC (X14) ABSOL.ENC. (DIP)					
942	Enc. factor numerator	**1**...32767					
943	Encoder factor denominator	**1**...32767					
944	Encoder scaling ext. encoder	**x1**/x2/x4/x8/x16/x32/x64		Only with MOVITOOLS. Not visible on the DBG11B keypad.			
945	Encoder type (X14)	TTL / SIN/COS / HIPER-FACE					
946	Zählrichtung X14	**NORMAL**/INVERTIERT					
95_	**DIP**						
950	Encoder type	**NO ENCODER**					
951	Counting direction	**NORMAL**/INVERTED					
952	Cycle frequency	**1**...200 %					
953	Position offset	$-(2^{31}-1)$...**0**...2^{31}-1					
954	Zero offset	$-(2^{31}-1)$...**0**...2^{31}-1					
955	Encoder scaling	**x1**/x2/x4/x8/x16/x32/x64					
96_	**IPOS Modulo Function**						
960	Modulo function	**OFF**/SHORT/CW/CCW					
961	Modulo numerator	**0**...2^{31}					
962	Modulo denominator	**0**...2^{31}					
963	Modulo encoder resolution	0...**4096**...20000					

5.8 Starting up the inverter with PROFIBUS-DP (MCH41A)

Configuring the PROFIBUS-DP interface

It is necessary for the DP master to send a certain DP configuration to the drive inverter to define the type and number of input and output data used for transfer. In doing this, you have the opportunity to

- control the drive using process data
- read and write all drive parameters using the parameter channel.

The following figure shows a schematic of the data exchange between the programmable controller (DP master) and the MOVIDRIVE® drive inverter (DP slave) with the process data and parameter channel.

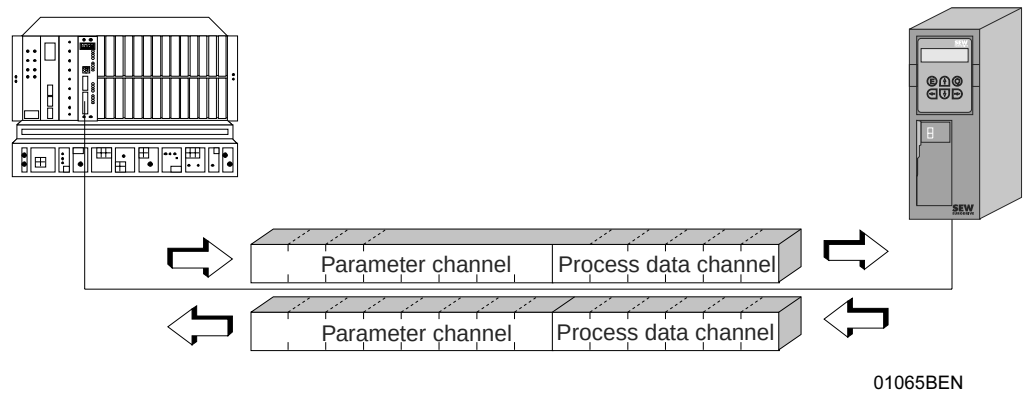


Figure 51: Communication via PROFIBUS-DP

Process data configuration

MOVIDRIVE® *compact* drive inverters make it possible to have different DP configurations for exchanging data between the DP master and the inverter. The following table provides additional information about all possible DP configurations for the MOVIDRIVE® *compact* range. The 'Process data configuration' column lists the names of the configurations. These texts also appear as a selection list in your project planning software for the DP master. The DP configurations column shows which configuration data are sent to the inverter when the PROFIBUS-DP connection is established.

Process data configuration	Meaning / information	DP configurations	
		0	1
1 PD	Control by 1 process data word	240_{dec}	-
2 PD	Control by 2 process data words	241_{dec}	-
3 PD	Control by 3 process data words	242_{dec}	-
6 PD	Control by 6 process data words	0_{dec}	245_{dec}
10 PD	Control by 10 process data words	0_{dec}	249_{dec}
Param + 1 PD	Control by 1 process data word Parameter setting using 8-byte parameter channel	243_{dec}	240_{dec}
Param + 2 PD	Control by 2 process data words Parameter setting using 8-byte parameter channel	243_{dec}	241_{dec}
Param + 3 PD	Control by 3 process data words Parameter setting using 8-byte parameter channel	243_{dec}	242_{dec}
Param + 6 PD	Control by 6 process data words Parameter setting using 8-byte parameter channel	243_{dec}	245_{dec}
Param + 10 PD	Control by 10 process data words Parameter setting using 8-byte parameter channel	243_{dec}	249_{dec}

'Universal configuration' DP configuration

Selecting the 'Universal configuration' DP configuration gives you two DP identifiers defined as 'blank spaces' (often referred to as DP modules) with the entry 0_{dec}. You can now configure these two identifiers individually, although you must comply to the following operating conditions:

Module 0 (DP identifier 0) defines the parameter channel of the inverter:

Length	Function
0	Parameter channel switched off
8 bytes or 4 words	Parameter channel is being used

Module 1 (DP identifier 1) defines the process data channel of the inverter:

Length	Function
2 bytes or 1 word	1 process data word
4 bytes or 2 words	2 process data words
6 bytes or 3 words	3 process data words
12 bytes or 6 words	6 process data words
20 bytes or 10 words	10 process data words

The following figure shows the structure of the configuration data defined in EN 50170 (V2). These configuration data are transferred to the inverter when the DP master is starting up.

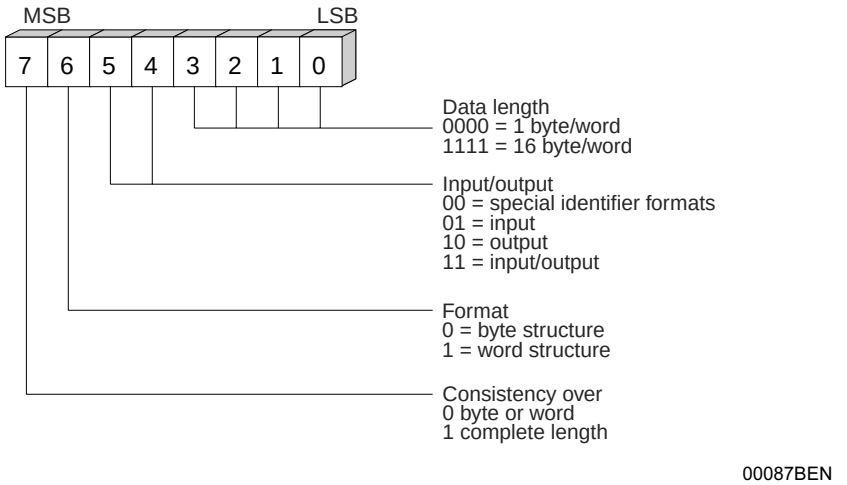


Figure 52: Format of the Cfg_Data identifier byte according to EN IEC 61158

Data consistency

Consistent data are data that have to be transmitted between the programmable controller and the drive inverter as one block at all times and are not to be transmitted separately from one another.

Data consistency is very important for transmitted position values or complete positioning tasks. The reason being that data not transmitted consistently could be from different program cycles of the programmable controller, which would lead to undefined values being transmitted to the drive inverter.

In the case of PROFIBUS-DP, data communication always takes place between the programmable controller and the inverter using the 'Data consistency throughout entire length' setting.

External diagnostics

For MOVIDRIVE® *compact*, it is possible to activate automatic generation of external diagnostic alarms via PROFIBUS-DP during the project planning in the DP master. If this function has been activated, MOVIDRIVE® *compact* sends an external diagnostic signal to the DP master every time a malfunction occurs. It is then necessary to program corresponding algorithms in the program of the DP master system to evaluate the diagnostic information. These algorithms can sometimes be quite complex.

Recommendation

It is basically not necessary to activate the external diagnostic function because MOVIDRIVE® *compact* transmits the current drive status in status word 1 during every PROFIBUS-DP cycle.

Note regarding Simatic S7 master systems

Diagnostic alarms may be triggered by the PROFIBUS-DP system in the DP master at any time even when external diagnostic signal generation is inactive. This means the corresponding operation blocks (e.g. OB84 for S7-400 or OB82 for S7-300) should always be created in the controller.

For more information, please refer to the Readme file included with the GSD file.

Identity number

Each DP master and DP slave must have its individual identity number which is assigned by the PROFIBUS user organization. This number uniquely identifies the connected unit. When the PROFIBUS-DP master starts up, it compares the identity numbers of the connected DP slaves with the identity numbers the user has entered in the project planning. User data transfer is not activated until the DP master has made sure that the connected station addresses and unit types (identity numbers) correspond to the project planning data. As a result, this process provides a high degree of protection against project planning mistakes.

The identity number is defined as an unsigned 16-bit number. The PROFIBUS user organization has defined the following identity numbers for the MOVIDRIVE® *compact* drive inverter unit series.

- MOVIDRIVE® compact MCH41A → 6003_{hex} (24579_{dec})

Control via PROFIBUS-DP

The drive inverter is controlled via the process data channel which is one, two or three I/O words in length. These process data words are reproduced in the I/O or peripheral area of the controller, for example when a programmable logic controller is used as the DP master. As a result, they can be addressed in the usual manner (see the following figure).

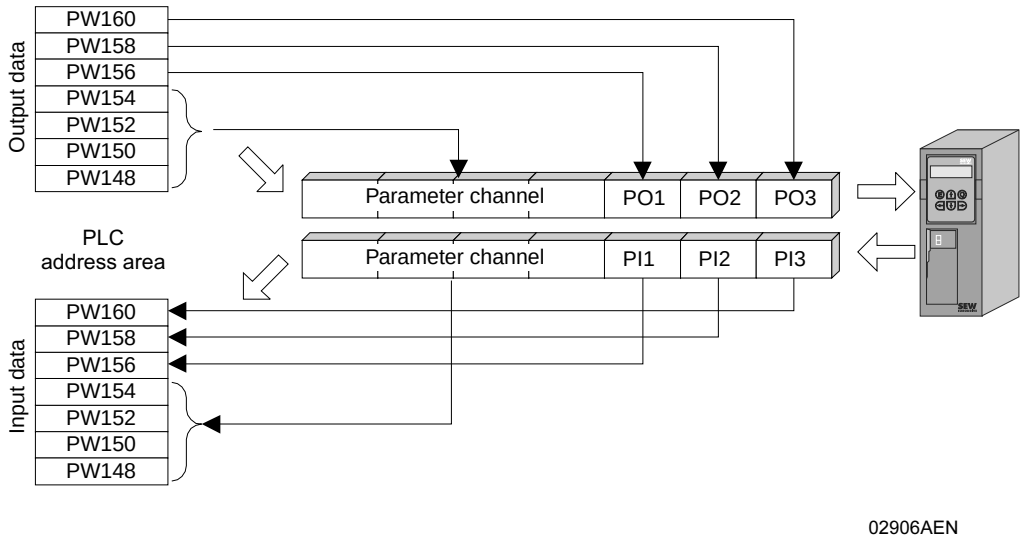


Figure 53: Assignment of the I/O area of the PLC

Control example for Simatic S5

While the process input data (actual values) are being read in, e.g. using load commands with the Simatic S5, it is possible to send the process output data (setpoints) using the transfer commands. Starting from Figure 53, the example shows the syntax for processing the process input data and process output data of the MOVIDRIVE® drive inverter. The factory setting for the process data channel is specified in the remark.

Sample STEP5 program

In this example, the project planning for MOVIDRIVE® has the process data configuration '3 PD' on input addresses PW156...161 and output addresses PW156...161. In this case, consistent access takes place in the 'last byte first' sequence.

In the Simatic S5, data consistency is principally determined by the CPU type. Please refer to the manuals for the CPU or the DP master module of the Simatic S5 for information about correct programming with data consistency.

```
//Read in actual values consistently
L...PW 160        //Load PI3 (no function)
L...PW 158        //Load PI2 (speed actual value)
L...PW 156        //Load PI1 (status word 1)

//Output setpoints consistently
L...KH 0
T PW 160          //Write 0hex to PO3 (no function)

L KF +1500
T...PW 158        //Write 1500dec to PO2 (speed setpoint = 300 rpm)

L KH 0006
T...PW 156        //Write 6hex to PO1 (control word = enable)
```

Control example for Simatic S7

The drive inverter is controlled using Simatic S7 in accordance with the selected process data configuration either directly using load and transfer commands or by means of special system functions, SFC 14 DPRD_DAT and SFC15 DPWR_DAT.

In principle with S7, data lengths of 3 bytes or more have to be transferred as 4 bytes using the SFC14 and SFC15 system functions. The following table applies:

Process data configuration	Program access
1 PD	Load/transfer commands
2 PD	Load/transfer commands
3 PD	System functions SFC14/15 (length 6 bytes)
6 PD	System functions SFC14/15 (length 12 bytes)
10 PD	System functions SFC14/15 (length 20 bytes)
Param + 1 PD	Parameter channel: System functions SFC14/15 (length 8 bytes) Process data: Load/transfer commands
Param + 2 PD	Parameter channel: System functions SFC14/15 (length 8 bytes) Process data: Load/transfer commands
Param + 3 PD	Parameter channel: System functions SFC14/15 (length 8 bytes) Process data: System functions SFC14/15 (length 6 bytes)
Param + 6 PD	Parameter channel: System functions SFC14/15 (length 8 bytes) Process data: System functions SFC14/15 (length 12 bytes)
Param + 10 PD	Parameter channel: System functions SFC14/15 (length 8 bytes) Process data: System functions SFC14/15 (length 20 bytes)

Sample STEP7 program

In this example, the project planning for MOVIDRIVE® *compact* has the process data configuration '3 PD' on input addresses PIW576...and output addresses POW576 . A data block DB3 is created with about 50 data words.

When SFC14 is called up, the process input data are copied into data block DB3, data words 0, 2 and 4. When SFC15 is called up after the control program has been processed, the process output data are copied from data words 20, 22 and 24 into output address POW 576 .

Note the length information in bytes in case of the RECORD parameter. This value must correspond to the configured length.

Please refer to the online help for STEP7 for further information about the system functions.

```
//Start of cyclical program processing in OB1
BEGIN
NETWORK
TITLE = Copy PI data from inverter to DB3, word 0/2/4
CALL SFC...14 (DPRD_DAT)                    //Read DP slave record
    LADDR...:= W#16#240                     //Input address 576
    RET_VAL:= MW 30                         //Result in flag word 30
    RECORD := P#DB3.DBX 0.0 BYTE 6          //Pointer

NETWORK
TITLE = PLC program with drive application
// PLC program uses the process data in DB3 for
// controlling the drive
L DB3.DBW 0                                 //Load PI1 (status word 1)
L...DB3.DBW 2                               //Load PI2 (speed actual value)
L...DB3.DBW 4                               //Load PI3 (no function)

L W#16#0006
T...DB3.DBW 20          //Write 6hex to PO1 (control word = enable)
L...1500
T DB3.DBW 22            //Write 1500dec to PO2 (speed setpoint = 300 rpm)
L W#16#0000
T...DB3.DBW 24          //Write 0hex to PO3 (no function)

//End of cyclical program processing in OB1
NETWORK
TITLE = Copy PO data from DB3, word 20/22/24 to inverter
CALL SFC...15 (DPWR_DAT)                    //Write DP slave record
    LADDR...:= W#16#240                     //Output address 576 = 240hex
    RECORD := P#DB3.DBX 20.0 BYTE 6         //Pointer to DB/DW
    RET_VAL:= MW 32                         //Result in flag word 32
```

Please refer to the Fieldbus Unit Profile manual (available from SEW) for more detailed information and sample applications for control via the process data channel, in particular concerning the coding of the control and status word.

Parameter setting via PROFIBUS-DP

With PROFIBUS-DP, the drive parameters are accessed via the MOVILINK® parameter channel. This offers extra parameter services in addition to the conventional READ and WRITE services.

Structure of the parameter channel

In order to set the parameters of peripheral units via fieldbus systems which do not provide an application layer, it is necessary to recreate the most important functions and services such as READ and WRITE for reading and writing parameters. To do this with PROFIBUS-DP, define a parameter process data object (PPO). This PPO is transmitted cyclically. In addition to the process data channel, it contains a parameter channel for the exchange of acyclical parameter values (→ Figure 54).

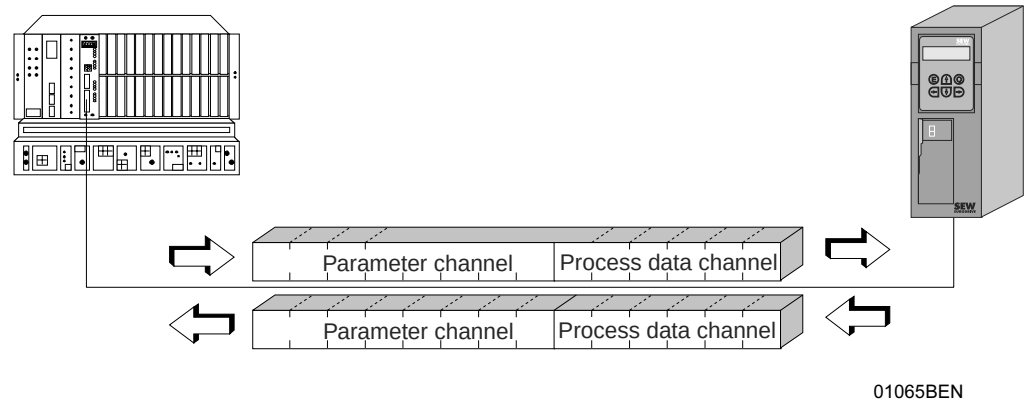


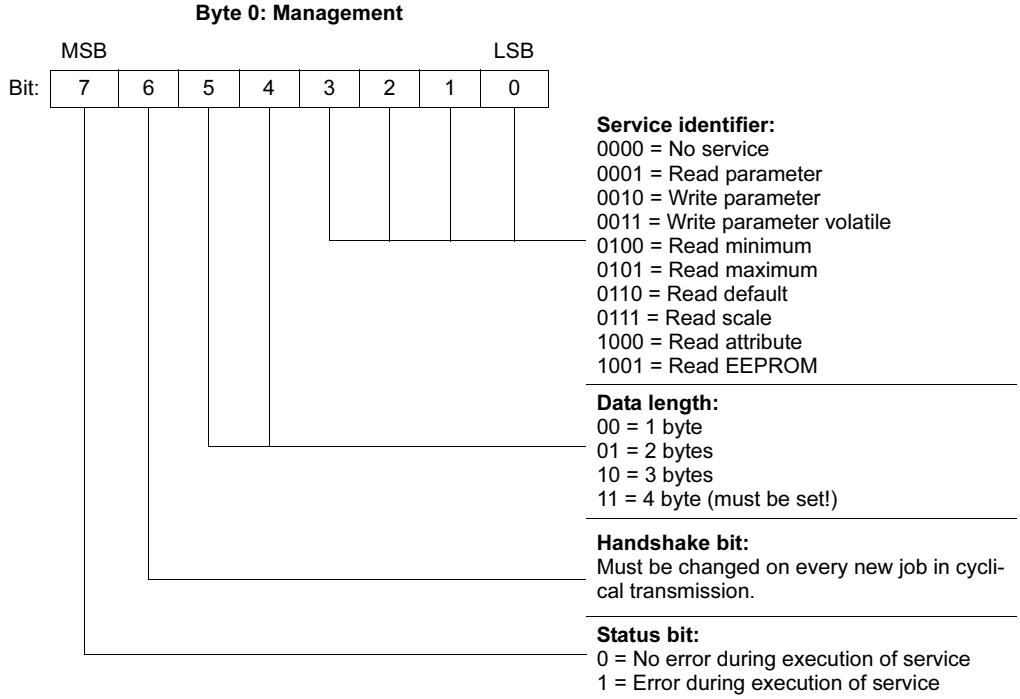
Figure 54: Parameter process data object for PROFIBUS-DP

The structure of the parameter channel is shown below. In principle, it is made up of a management byte, an index word, a reserved byte and four data bytes.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Management	Reserved	Index high	Index low	Data MSB	Data	Data	Data LSB
		Parameter index			4 byte data		

Administration of the parameter channel

The entire parameter setting sequence is coordinated with 'Byte 0: Management'. This byte is used for providing important service parameters such as service identifier, data length, version and status of the service performed. Bits 0, 1, 2 and 3 contain the service identifier. These bits define which service is performed. Bit 4 and bit 5 specify the data length in bytes for the write service. This should be set to 4 bytes for all SEW drive inverters.



Bit 6 is used as an acknowledgment between the controller and the drive inverter. It triggers the implementation of the transferred service in the drive inverter. In particular with PROFIBUS-DP, the parameter channel is transmitted cyclically with the process data. For this reason, the implementation of the service in the drive inverter must be triggered by edge control using handshake bit 6. To permit this, the value of this bit is altered for each new service to be performed (toggle). The drive inverter uses the handshake bit to signal whether the service was performed or not. The service has been performed as soon as the handshake bit received in the control corresponds to the one which was sent. Status bit 7 indicates whether it was possible to carry out the service properly or if there were errors.

Index addressing

'Byte 2: Index high' and 'Byte 3: Index low' determine the parameter which is to be read or written via the fieldbus system. The parameters of a drive inverter are addressed with a uniform index regardless of the connected fieldbus system. Byte 1 should be viewed as reserved and must always be set to 0x00.

Data range

The data are located in byte 4 to byte 7 of the parameter channel. This means up to 4 bytes of data can be transmitted per service. The data are always entered with right-justification, i.e. byte 7 contains the least significant data byte (data-LSB) whereas byte 4 is the most significant data byte (data-MSB).

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Manage-ment	Reserved	Index high	Index low	Data MSB	Data	Data	Data LSB
				High byte 1	Low byte 1	High byte 2	Low byte 2
				High word		Low word	
				Double word			

Incorrect performance of service

The status bit in the management byte is set to signal that a service has been performed incorrectly. The service was performed by the drive inverter if the received handshake bit is the same as the sent handshake bit. If the status bit now signals an error, the error code is entered in the data range of the parameter message. Bytes 4...7 send back the return code in a structured format (→ Sec. 'Return codes for parameter setting' on page 78).

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Manage-ment	Reserved	Index high	Index low	**Error class**	**Error code**	**Add. code high**	**Add. code low**

↓

Status bit = 1: Incorrect performance of service

Return codes for parameter setting

In the event of an incorrect parameter setting, the drive inverter sends back various return codes to the master which set the parameters. These codes provide detailed information about the cause of the error. All of these return codes are structured in accordance with EN 50170. The system distinguishes between the following elements:

- Error class
- Error code
- Additional code

These return codes apply to all communications interfaces of MOVIDRIVE®.

Error class

The error class element classifies the type of error more precisely. MOVIDRIVE® *compact* supports the following error classes as defined in EN 50170 (V2):

Class (hex)	Name	Meaning
1	vfd-state	Status error of the virtual field unit
2	application-reference	Error in application program
3	definition	Definition error
4	resource	Resource error
5	service	Error when performing service
6	access	Access error
7	ov	Error in object list
8	other	Other error (see additional code)

The error class is generated by the communications software of the fieldbus interface if there is an error in communication. This statement does not apply to error class 8, 'Other error.' Return codes sent from the drive inverter system are all in error class 8, 'Other error.' The error can be more precisely identified using the additional code element.

Error code

The error code element provides a means for more precisely identifying the cause of the error within the error class. It is generated by the communications software of the fieldbus interface in the event of an error in communication....Only error code 0 (Other error code) is defined for error class 8, 'Other error.' In this case, detailed identification is made using the additional code.

Additional code

The additional code contains the return codes specific to SEW dealing with incorrect parameter settings of the drive inverter. They are sent back to the master in error class 8, 'Other error.' The following table shows all possible codings for the additional code.

Error class: 8 = 'Other error'

Add. code high (hex)	Add. code low (hex)	Meaning
00	00	No fault
00	10	Invalid parameter index
00	11	Function/parameter not implemented
00	12	Read access only
00	13	Parameter lock is active
00	14	Factory setting is active
00	15	Value for parameter too large
00	16	Value for parameter too small
00	17	Option card required for this function/parameter is missing
00	18	Error in system software
00	19	Parameter access via RS-485 process interface on X13 only
00	1A	Parameter access via RS-485 diagnostic interface only
00	1B	Parameter has access protection
00	1C	Controller inhibit required
00	1D	Impermissible value for parameter
00	1E	Factory setting was activated
00	1F	Parameter was not saved in EEPROM
00	20	Parameter cannot be changed with output stage enabled

Special return codes (special cases)

Faults in parameter settings which cannot be identified either automatically by the application layer of the fieldbus system or by the system software of the drive inverter are treated as special cases. This refers to the following possible faults:

- Incorrect coding of a service via parameter channel
- Incorrect length specification of a service via parameter channel
- Internal communications error

Incorrect service coding in the parameter channel

A non-defined coding was specified in the management or reserved byte during parameter setting via the parameter channel. The following table shows the return code for this special case.

	Code (dec)	Meaning
Error class:	5	Service
Error code:	5	Illegal parameter
Add. code high:	0	-
Add. code low:	0	-

Correcting the fault:

Check bytes 0 and 1 in the parameter channel.

Incorrect length specification in parameter channel

A data length other than 4 data bytes was specified in a write service during parameter setting via the parameter channel. The following table displays the return code.

	Code (dec)	Meaning
Error class:	6	Access
Error code:	8	Type conflict
Add. code high:	0	-
Add. code low:	0	-

Correcting the fault:

Check bit 4 and bit 5 for the data length in the management byte of the parameter channel.

Internal communications error

The return code listed in the following table is sent back if a communications error has occurred within the system. The requested parameter service may not have been performed and should be repeated. If this error reoccurs, it is necessary to switch off the drive inverter completely and then back on again so it is re-initialized.

	Code (dec)	Meaning
Error class:	6	Access
Error code:	2	Hardware fault
Add. code high:	0	-
Add. code low:	0	-

Correcting the fault:

Repeat the parameter service. De-energize the drive inverter if the error reoccurs (supply voltage + ext. 24 V_{DC}) and then switch it back on. Contact SEW Service for advice if this error occurs continuously.

Reading a parameter with PROFIBUS-DP (Read)

In order to perform a READ service using the parameter channel, the handshake bit must not be changed until the entire parameter channel has been prepared in accordance with the service. This is because cyclical transfer takes place on the parameter channel. As a result, adhere to the following sequence in order to read a parameter:

1. Enter the index of the parameter to be read in byte 2 (Index high) and byte 3 (Index low).
2. Enter the service identifier for the read service in the management byte (byte 0).
3. Transfer the read service to the inverter by changing the handshake bit.

Since this is a read service, the sent data bytes (bytes 4...7) and the data length (in the administration byte) are ignored and consequently do not need to be set.

The inverter now processes the read service and sends the service confirmation back by changing the handshake bit.

Byte 0: Management

7	6	5	4	3	2	1	0
0	0/1	X	X	0	0	0	1

Service identifier:
0001 = Read

Data length:
Not relevant for READ service

Handshake bit:
Must be changed with every new job.

Status bit:
0 = No error during execution of service
1 = Error during execution of service

X = Not relevant
0/1 = Bit value is changed

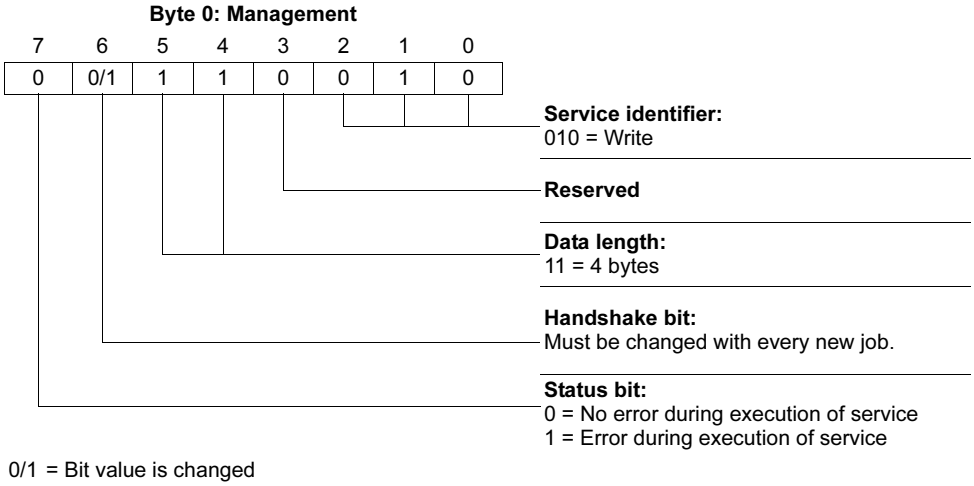
The data length is not relevant; only the service identifier for the READ service should be entered. This service is now activated in the drive inverter when the handshake bit changes. For example, it would be possible to activate the read service with the management byte coding 01_{hex} or 41_{hex}.

Writing a parameter with PROFIBUS-DP (Write)

In order to perform a WRITE service using the parameter channel, the handshake bit must not be changed until the entire parameter channel has been prepared in accordance with the service. This is because cyclical transfer takes place on the parameter channel. As a result, adhere to the following sequence in order to write a parameter:

1. Enter the index of the parameter to be written in byte 2 (Index high) and byte 3 (Index low).
2. Enter the data to be written in bytes 4...7.
3. Enter the service identifier and the data length for the write service in the administration byte (byte 0).
4. Transfer the write service to the inverter by changing the handshake bit.

The inverter now processes the write service and sends the service confirmation back by changing the handshake bit.


Byte 0: Management
7 6 5 4 3 2 1 0
0 0/1 1 1 0 0 1 0
Service identifier:
010 = Write
Reserved
Data length:
11 = 4 bytes
Handshake bit:
Must be changed with every new job.
Status bit:
0 = No error during execution of service
1 = Error during execution of service
0/1 = Bit value is changed

The data length is 4 bytes for all parameters in SEW drive inverters. This service is now transferred to the drive inverter when the handshake bit changes. As a result, a write service on SEW drive inverters always has the management byte coding 32_{hex} or 72_{hex}.

Procedure for programming with PROFIBUS-DP

Taking the example of the WRITE service, is intended to represent a process of setting parameters between the control and the drive inverter via PROFIBUS-DP (→ Figure 55). To simplify the sequence, Figure 55 only shows the management byte of the parameter channel.

The parameter channel is only received and returned by the drive inverter while the controller is preparing the parameter channel for the write service. The service is not activated until the handshake bit is changed (in this example, when it changes from 0 to 1). The drive inverter now interprets the parameter channel and processes the write service; however, it continues to respond to all messages with handshake bit = 0. Confirmation that the service has been performed occurs when the handshake bit in the response telegram of the drive inverter is changed. The controller now detects that the received handshake bit is once again the same as the one which was sent. It can now prepare another parameter setting procedure.

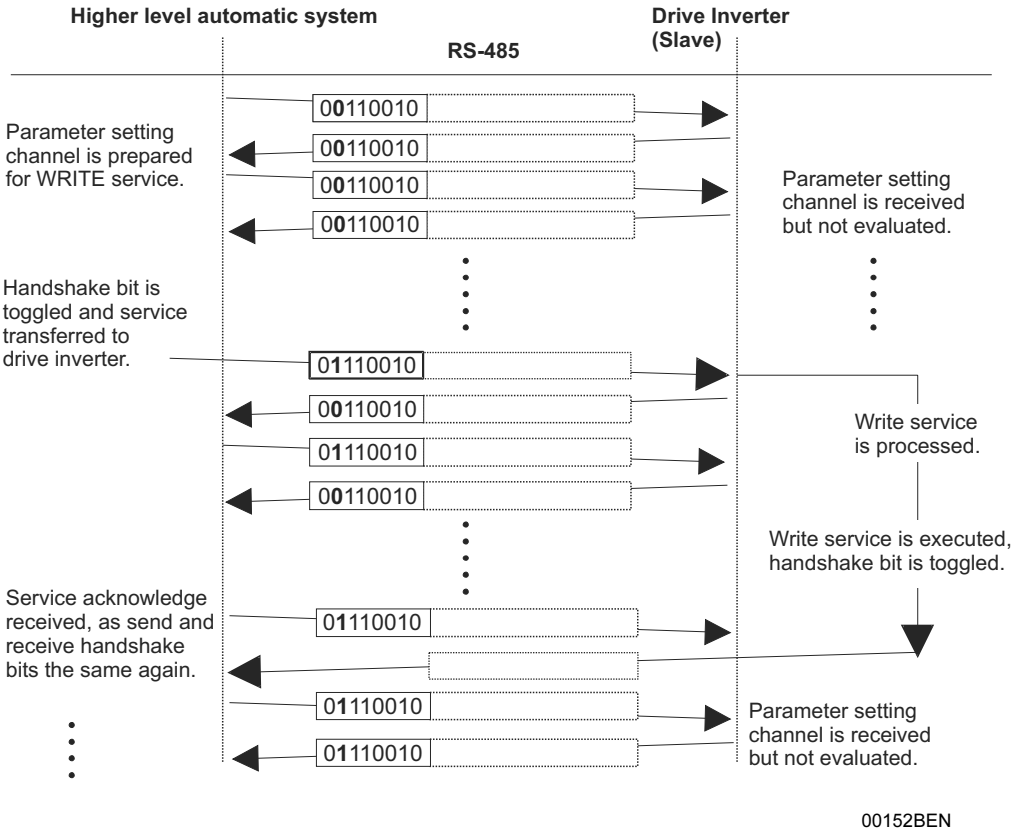

Higher level automatic system
RS-485
Drive Inverter (Slave)
00110010
Parameter setting channel is prepared for WRITE service.
Parameter setting channel is received but not evaluated.
Handshake bit is toggled and service transferred to drive inverter.
01110010
Write service is processed.
Write service is executed, handshake bit is toggled.
Service acknowledge received, as send and receive handshake bits the same again.
Parameter setting channel is received but not evaluated.
00152BEN

Figure 55: Parameter setting procedure

Parameter data format

When parameters are set via the fieldbus interface, the same parameter coding is used as with the serial RS-485 interfaces or the system bus.

The data formats and ranges of values for the individual parameters can be found in the 'MOVIDRIVE® Serial Communication' manual which can be ordered from SEW.

5.9 Starting up the inverter with INTERBUS (MCH42A)

The parameters of the MOVIDRIVE® *compact* MCH42A inverter can be set straight away via INTERBUS without any further settings once the INTERBUS interface has been installed. As a result, all parameters can be set by the master automation system after switch-on.

To do this, the "Control signal source" must be set to FIELDBUS in the inverter (P100 = FIELDBUS and P101 = FIELDBUS). The FIELDBUS setting means the inverter parameters are set for control and setpoint entry via INTERBUS. The inverter then responds to the process output data transmitted from the programmable master controller.

Activation of the control signal source/setpoint source FIELDBUS is signaled to the machine control using the 'Fieldbus mode active' bit in the status word. For safety reasons, the inverter must also be enabled on the terminal side for control via the fieldbus system. Accordingly, the terminals must be wired up or programmed in such a way that the inverter is enabled via the input terminals.

The simplest way of enabling the inverter on the terminal side is to connect the DIØØ (/ CONTROLLER INHIBIT) input terminal to a '1' signal and to program input terminals DIØ1...DIØ3 to 'NO FUNCTION'.

Preliminary work for startup

1. Enable the inverter on the terminal side. To do this, apply a '1' signal to X11:1 (DIØØ '/CONTROLLER INHIBIT'), for example using a jumper to X11:8 (VO24).
2. Only switch on the 24 V_{DC} voltage supply; do not switch on the supply voltage yet. You can now set the parameters of the inverter without the connected motor starting up inadvertently.
3. Set the setpoint source and control signal source to FIELDBUS (P100 = FIELDBUS and P101 = FIELDBUS).
4. Set binary inputs DIØ1...DIØ3 to 'NO FUNCTION' (P600...P602 = 'NO FUNCTION').

Configuring the INTERBUS system

There are two configuration steps for the inverter in the INTERBUS interface module using the 'CMD Tool' project planning software (CMD = Configuration Monitoring Diagnostics).

1. Create the bus structure
2. Station description and address setting for process data

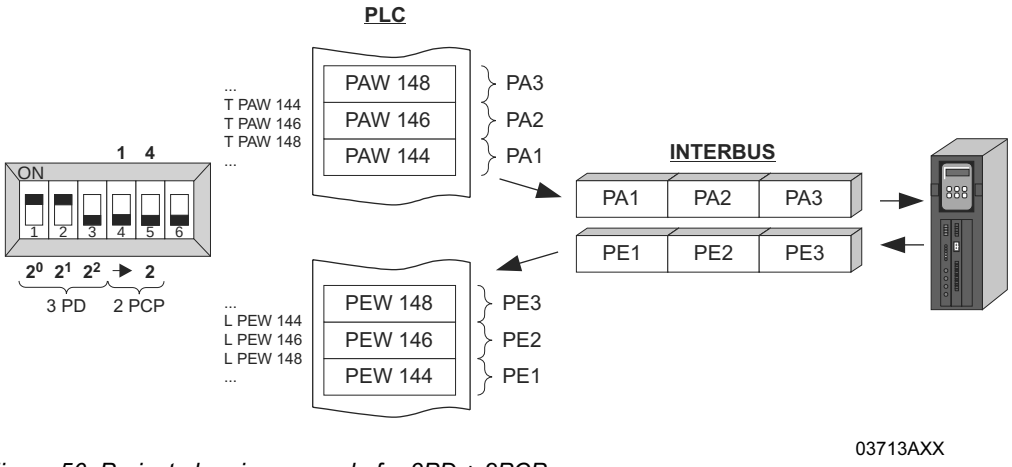


Figure 56: Project planning example for 3PD + 2PCP

The figures below show the settings in the CMD Tool for an inverter configured with 3PD + 2PCP as shown in Figure 56, with input/output addresses 144...149 in the control.

Configuring the bus structure

The bus structure can be configured online or offline using the CMD Tool.

Offline configuration: Insert with ID code

In offline status, the inverter is configured in the CMD Tool using the 'Edit / Insert with ID code' menu command. When doing this, you must enter the values for the ID code, process data channel and station type as shown in Figure 57.

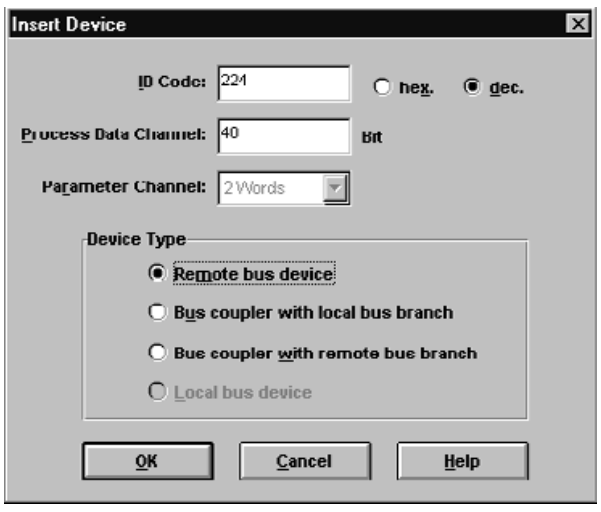


Figure 57: Offline configuration with CMD Tool

Note!

Not all combinations are possible, because the inverter can occupy up to six words in the INTERBUS!

Information for offline configuration in CMD Tool

The following table shows the possible settings. The ID code setting must match the DIP switches S4 and S5. The process data channel setting must match the DIP switches S1 to S3. Otherwise, INTERBUS operation is not possible.

	Program setting	Function (MOVIDRIVE display)
ID code	227 dec (E3 hex)	Parameter channel: 1 word
Process data channel:	16 bits	1 process data word (Param+1PD)
	32 bits	2 process data words (Param + 2 PD)
	48 bits	3 process data words (Param +3 PD)
	64 bits	4 process data words (Param + 4 PD)
	80 bits	5 process data words (Param + 5 PD)
ID code	224 dec (E0 hex)	Parameter channel: 2 words
Process data channel:	16 bits	1 process data word (Param + 1PD)
	32 bits	2 process data words (Param + 2 PD)
	48 bits	3 process data words (Param + 3 PD)
	64 bits	4 process data words (Param + 4 PD)
ID code	225 dec (E1 hex)	Parameter channel: 4 words
Process data channel:	16 bits	1 process data word (Param + 1 PD)
	32 bits	2 process data words (Param + 2 PD)
ID code	3 dec (03 hex)	Parameter channel: -
Process data channel:	96 bits	6 process data words (6PD)

Online configuration: Configuration frame / Read in

The INTERBUS system can also be fully installed first and then DIP switches S1 to S6 set. Following this, the entire bus structure can be read in with the CMD Tool (configuration frame). All stations are automatically detected with their data width settings.

Creating a station description

The INTERBUS stations can be identified and described uniquely using an individual station description created for the inverter in the INTERBUS system.

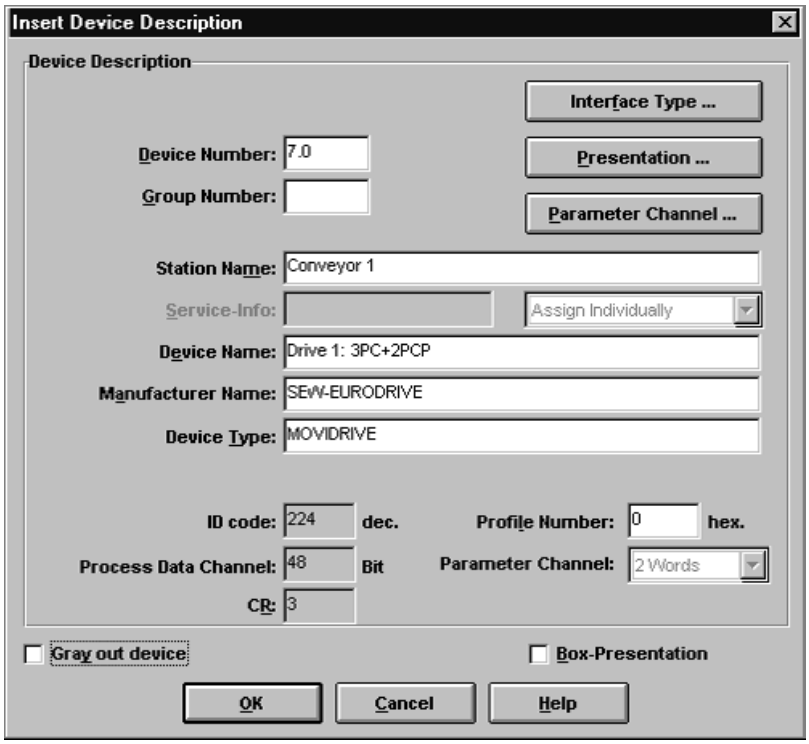
The following entries are significant:

Station description

The 'Manufacturer Name' and 'Device Type' must have the following entries:

- Manufacturer name:SEW-EURODRIVE
- Device type:MOVIDRIVE

Once these entries have been made, the drive parameters can be set using a management PC from the management level via the INTERBUS interface module (Figure 58).



03715AXX

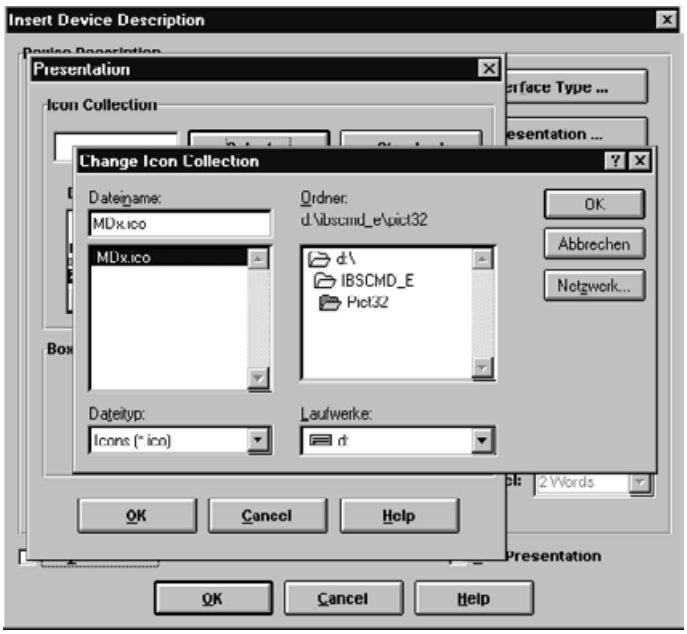
Figure 58: Station description for MOVIDRIVE® compact MCH42A

Interface type

Select 'Fiber optic remote bus' as the interface type.

Representation

You can copy your own ICO files into the '.\IBSCMD\PICT32\' directory as of CMD Tool 4.50 for easy identification of the inverter (Figure 59). The INTERBUS description files for the CMD Tool are available on the SEW website at http://www.SEW-EURODRIVE.com in the 'Software' section.



03716AXX

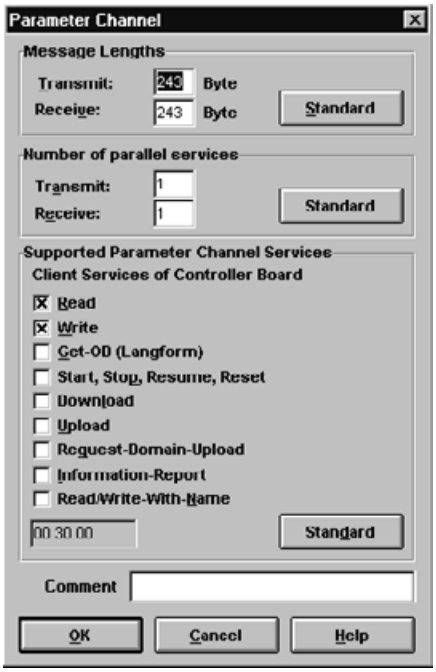
Figure 59: Linking the station description with the ICO file

Parameter channel

You must make the following settings for the parameter channel if you want to use the PCP channel for setting the inverter parameters in your application.

- Telegram lengths / Transmit / Receive:

  243 bytes each
- Supported parameter channel services (standard): Read / Write



03717AXX

Figure 60: Setting the parameter channel (PCP)

Assigning process data

INTERBUS process data of the inverter are assigned to the program addresses of the control system using the 'Process Data' shortcut menu.

03718AXX

Figure 61: Assigning INTERBUS process data and PLC program addresses

Refer to the chapter for a sample program (STEP7) for controlling the inverter using the INTERBUS process data.

Testing the PCP connection

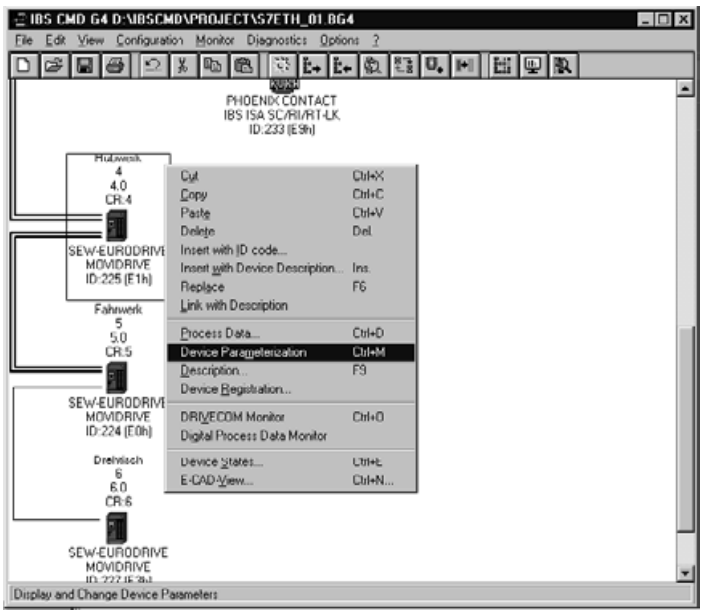
You can use the MONITOR mode of the CMD Tool for testing the PCP connection to the inverter. The following figures illustrate the PCP test procedure. Basically, this method involves establishing a PCP connection to the unit and reading the parameter list (object list) stored in the unit.

Set the CMD Tool to 'Monitoring' status.

03719AXX

Figure 62: Setting CMD Tool to 'MONITORING' status

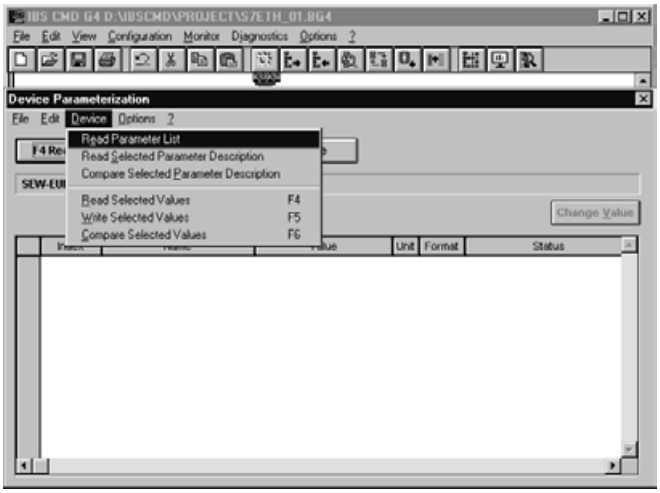
Click the inverter to which you want to establish a PCP connection. Press the right mouse button to open the shortcut menu and select the 'Device Parameterization' menu command.



03721AXX

Figure 63: Testing the PCP device parameterization

In the 'Device Parameterization' window, select the 'Device / Read Parameter List' menu command.



03722AXX

Figure 64: Window for device parameterization using the CMD Tool

The configuration of the PCP channel has been performed correctly once the device parameters have been imported. You can break off the read-in procedure.

Check the PCP configuration and the assignment of CRs if you get an error message instead of the progress bar. If necessary, reformat the parameterization memory of the interface module and then write the current project into the parameterization memory again. Now run the parameterization procedure for the interface module again and repeat this test sequence to check the PCP connection.

03723AXX

Figure 65: CMD Tool is reading in device parameters, i.e. PCP communication is OK

Overview of basic structure

The MOVIDRIVE® *compact* MCH42A inverter offers a standardized interface for parameterization using the 'Peripherals Communication Protocol' (PCP). This INTERBUS communications channel gives you complete access to all MOVIDRIVE® drive parameters.

The PCP channel must be configured with the corresponding ID code so you can access parameter values in the inverter. There are one, two or four words available in the INTERBUS protocol for the PCP channel. Changing the number of PCP words varies the access speed to parameter values via the PCP channel.

Additional PCP channel for startup and diagnostics

The PCP interface is implemented using PCP version 3. In addition to the familiar PCP channel between the control system (PLC) and the inverter, it is now possible to establish an additional (logical) PCP channel between the interface module and the inverter. This additional PCP channel can be used by a supervisory computer to access the inverter parameter values via the Ethernet / INTERBUS communications pathway.

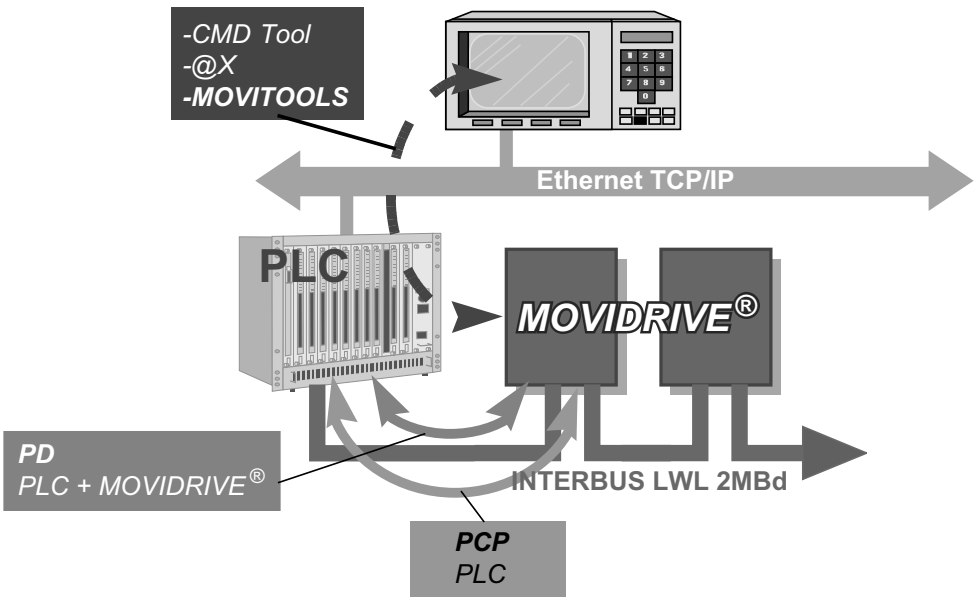


Figure 66: Communications channels with PCP version 3

Figure 66 shows a sample system topology with an Ethernet TCP/IP layer and an INTERBUS layer. In this case, an INTERBUS interface module is used with an Ethernet TCP/IP interface. This module functions as the gateway between the two communications layers.

In addition to the 'CMD Tool,' the supervisory computer also runs INTERBUS '@utomationXplorer' and 'MOVITOOLS' for programming and setting the parameters of the SEW inverter on the INTERBUS. This arrangement means existing bus infrastructures can be used for startup and maintenance. This setup facilitates startup and diagnostics of the entire automation system because the INTERBUS cable is now not only used for controlling but for startup and diagnostics of all components used on the fieldbus.

PCP services

The MOVIDRIVE® *compact* MCH42A inverter supports the PCP services shown in Figure 67. However, only the following services are of significance for setting the inverter parameters:

- Initiate
- Read
- Write
- Abort

Refer to the PCP communication user manual for your INTERBUS interface module for a detailed description of the PCP services.

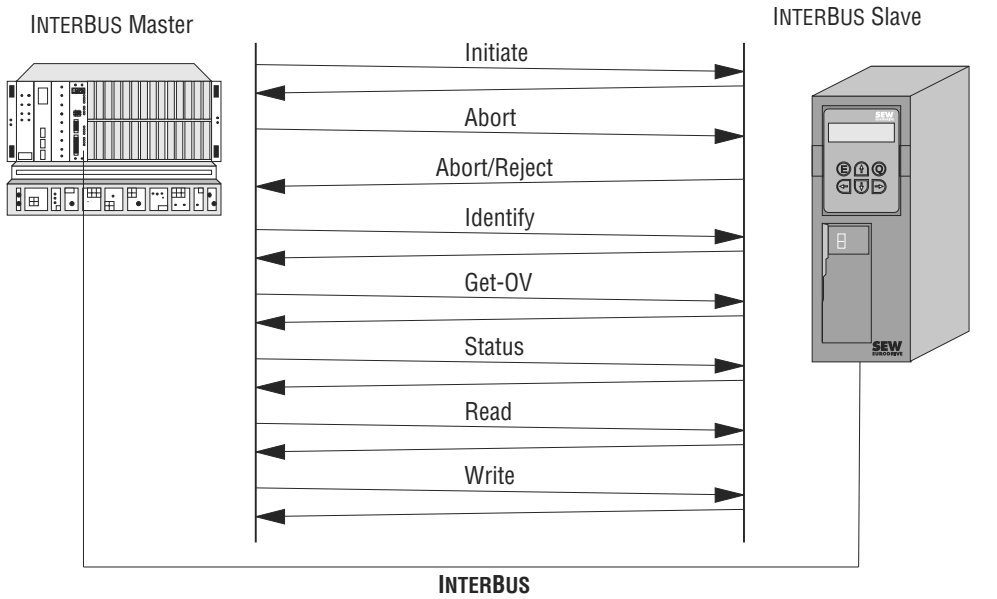


Figure 67: PCP services supported by MOVIDRIVE®

Establishing the communications link with 'Initiate'

The 'Initiate' PCP service establishes a communications link for exchanging parameters between an INTERBUS interface module and the MOVIDRIVE® inverter. Communication is always established from the INTERBUS interface module. Various arrangements relating to the communications link are checked during establishment of the connection, such as supported PCP services, user data length, etc. The inverter responds with a positive initiate response if the connection is established successfully. If the connection could not be established, then the arrangements for the communications link on the INTERBUS interface module do not match those on the MOVIDRIVE® inverter. The inverter responds with an initiate error response. In this case, compare the configured communications relationship list in the INTERBUS interface module with that in the inverter.

As a rule, an attempt to re-establish an existing communications link leads to an abort. The communications link is then dropped, which means the 'Initiate' PCP service has to be run for a third time in order to re-establish the communications connection.

Breaking off the communications link with 'Abort'

The 'Abort' PCP service breaks off an existing communications link between the INTERBUS interface module and the MOVIDRIVE® inverter. Abort is an unconfirmed PCP service and can be triggered either from the INTERBUS interface module or from MOVIDRIVE®.

Reading parameter values with 'Read'

The 'Read' PCP service gives the INTERBUS interface module read access to all communications objects (drive parameters) of the MOVIDRIVE® inverter. All drive parameters and their coding are presented in detail in the Fieldbus Unit Profile documentation and the list of MOVIDRIVE® parameters.

Writing parameter values with 'Write'

The 'Write' PCP service gives the INTERBUS interface module write access to all MOVIDRIVE® drive parameters. The inverter generates a write error response if incorrect access is made to a drive parameter (e.g. the written value is too great). Precise information is given relating to the cause of the error.

Parameters in the object list

The 'Read' and 'Write' PCP services give the INTERBUS interface module access to all parameters defined in the object list. All drive parameters which can be accessed via the bus system are described as communications objects in the static object list. All objects in the static object list are addressed using indices. The following table shows the structure of the object list for the MOVIDRIVE® *compact* MCH42A inverter.

The index range is subdivided into three logical areas. The drive parameters are addressed using indices 8300...8800dec. Refer to the MOVIDRIVE® parameter list in the SEW documentation for information about the parameter index. Indices below 8300dec are handled directly on the INTERBUS interface and are not to be viewed as drive parameters.

Parameter index (decimal)	Name of the communications object
8296	Download parameter block
8297	Last PCP index
8298	MOVILINK® parameter channel cyclical
8299	MOVILINK® parameter channel acyclical
8300...8800	Drive parameter for MOVIDRIVE® (can be accessed directly with the 'Read' and 'Write' PCP services, see the MOVIDRIVE® parameter list in the SEW documentation for information about the parameter index)
8801...9999	Drive parameters for MOVIDRIVE® (these parameters can only be accessed via the MOVILINK® parameter channel)
>10000	Table, program and variable memory (these parameters can only be accessed via the MOVILINK® parameter channel)

Object description of the drive parameters

The drive parameters of the MOVIDRIVE® inverter are described in detail in the MOVIDRIVE® parameter list in the SEW documentation. In addition to the parameter index, you will receive additional information about coding, the range of values and the meaning of the parameter data.

The object description in the object list is identical for all drive parameters. Even those parameters which can only be read are given the Read all/Write all attribute in the object list, because the inverter undertakes the corresponding check itself and sends back a return code if necessary. The following table shows the object description of all drive parameters.

Index:	8300...8800
Object code:	7 (simple variable)
Data type index:	10 (octet string)
Length:	4
Local address:	
Password:	
Access groups:	
Access rights:	Read all/Write all
Name[16]:	-
Extension length:	-

'Download parameter block' object

The 'download parameter block' object lets you write up to 38 MOVIDRIVE® drive parameters at the same time with only one write service. As a result, this object gives you the opportunity to set the parameters of the inverter in the startup phase, e.g. by calling up the write service only once. As a rule, it is only necessary to change a few parameters. As a result, this parameter block with its max. 38 parameters is sufficient for almost all applications. The user data area is defined as 38 x 6 + 2 bytes = 230 bytes (octet string type). The following table shows the structure of the 'download parameter block' object.

Octet	Meaning	Note
0	reserved (0)	
1	Number of parameters	1...38 parameters
2	Index high	1. Parameters
3	Index low	
4	Data MSB	
5	Data	
6	Data	
7	Data LSB	
8	Index high	
...	...	
223	Data LSB	
224	Index high	38. Parameters
225	Index low	
226	Data MSB	
227	Data	
228	Data	
229	Data LSB	

The 'download parameter block' object is only handled locally on the INTERBUS interface and is defined as in the following table.

Index:	8296
Object code:	7 (simple variable)
Data type index:	10 (octet string)
Length:	230
Local address:	
Password:	
Access groups:	
Access rights:	Write all
Name[16]:	-
Extension length:	-

The WRITE service on the 'download parameter block' object starts a parameter setting mechanism on the INTERBUS interface. This step puts all parameters specified in the user data area of the object into the DPRAM and therefore sets the parameters of the inverter. The write service is terminated with a positive write response once the download parameter block has been processed successfully, i.e. all parameters transmitted by the INTERBUS interface module have been written. A negative write response is returned in case of an error. The return code contains more detailed information about the type of error as well as the number of the parameter (no. 1...38) where the error occurred (see example).

```
Example: Write error response for an error when writing the 11th param-
eter:
Error class: 8  Other
Error code:  0  Other
Additional code high: 11dec Error when writing parameter 11
Additional code low: 15hex Value too large
```

Note the following points when using the download parameter block:

- Do not perform a factory setting within the download parameter block!
- All parameters written after the parameter lock has been activated will be rejected.

'Last PCP index' object

This object is 4 bytes long and, when read access is made, returns the numerical value of the last index which can be addressed directly using the PCP services. PCP accesses to indices greater than this numerical value must be made using the 'MOVILINK® parameter channel acyclical' object.

Index:	8297
Object code:	7 (simple variable)
Data type index:	10 (octet string)
Length:	4
Local address:	
Password:	
Access groups:	
Access rights:	Read all
Name[16]:	-
Extension length:	-

'MOVILINK® parameter channel cyclical'

This object is 8 bytes in length and contains the cyclical MOVILINK® parameter channel. All MOVILINK® communications services can be performed by cyclically alternating reading and writing of this object. The communications service is not performed until the handshake bit in the management byte has changed. The MOVILINK® parameter channel grants access to all indices and therefore also to the IPOS variable and program memory.

The following table shows the structure of this communications object. Refer to the 'MOVIDRIVE® Fieldbus Unit Profile and Parameter List' document for information about the structure of the parameter channel.

Octet	0	1	2	3	4	5	6	7
Meaning	Management	Reserved	Index high	Index low	Data MSB	Data	Data	Data LSB
Note	Management	Reserved	Parameter index		4 bytes data			

The 'MOVILINK® parameter channel cyclical' object is only handled locally on the INTERBUS interface.

Index:	8298
Object code:	7 (simple variable)
Data type index:	10 (octet string)
Length:	8
Local address:	
Password:	
Access groups:	
Access rights:	Read all/Write all
Name[16]:	-
Extension length:	-

The following table shows the procedure involved in a parameter access via the cyclical MOVILINK® parameter channel. The performance of the service is not started in the inverter until the control has changed the handshake bit in the parameter channel. To do this, the control program must read the parameter channel at the start of the parameter setting process to obtain the current status of the handshake bit in the inverter. Now, the master can initiate evaluation of the parameter channel in the inverter when the handshake bit changes.

The inverter now performs the service coded in the parameter channel and enters the service confirmation back in the parameter channel. The control program receives the service confirmation the next time it makes read access to the 'MOVILINK® parameter channel cyclical'. The following tables displays the procedure of the cyclically called read/write services for the 'MOVILINK parameter channel cyclical'.

Control (master)	MOVIDRIVE® (slave)
1. 'READ MOVILINK parameter channel cyclical', to evaluate the status of the handshake bit.	
READ 8298 (parameter channel) →	
← Data = Parameter channel	
2. Initiate the service coded in the parameter channel by means of a WRITE to the 'MOVILINK® parameter channel cyclical' object and toggling the handshake bit.	
WRITE 8298 (parameter channel) →	
← OK	
3. READ 'MOVILINK parameter channel cyclical' and evaluation of the service confirmation in the parameter channel.	
READ 8298 (parameter channel) →	
← Data = Parameter channel with result	

'MOVILINK parameter channel acyclical' object

The 'MOVILINK parameter channel acyclical' object is 8 bytes long and contains the MOVILINK parameter channel. This object can be used for acyclical parameter access, i.e. the inverter processes the service coded in the parameter channel every time a WRITE service is received on this object. The handshake bit is not evaluated! The following table shows the structure of the 'MOVILINK parameter channel acyclical'. Refer to the 'MOVIDRIVE® Fieldbus Unit Profile and Parameter List' document for information about the structure of the parameter channel.

Octet	0	1	2	3	4	5	6	7
Meaning	Management	Reserved	Index high	Index low	Data MSB	Data	Data	Data LSB
Note	Management	Reserved	Parameter index		4 bytes data			

There are two different procedures involved in setting the inverter parameters via the acyclical MOVILINK parameter channel:

- Parameter channel performs a write type service
- Parameter channel performs a read type service

Parameter channel performs a write type service

If a write type service is performed via the acyclical parameter channel (e.g. write parameter or write parameter volatile), the inverter responds with the current service confirmation when the service has been performed. The corresponding error code is returned if the write access is not correct.

This variant offers the advantage that the write services are processed by simply sending a WRITE 'MOVILINK parameter channel' once and the service confirmation can take place by evaluating the 'write confirmation.' The following table shows how write services are performed via the acyclical MOVILINK parameter channel.

Control (master)	**MOVIDRIVE® (slave)**
1. Initiate the service coded in the parameter channel by means of a WRITE to the 'MOVILINK® parameter channel cyclical' object.	
WRITE 8298 (parameter channel) →	
← Service confirmation (OK/error code)	

The WRITE service coded in the parameter channel is performed and the service confirmation is returned directly as the response.

Parameter channel performs a read type service

A PCP WRITE service has to be performed before a parameter can be read via the parameter channel. The PCP WRITE service defines where the inverter data should be available. A read service must take place on the acyclical parameter channel in order for these data to get to the master. As a result, a PCP WRITE and a PCP READ are always required for performing read services via the parameter channel. The following table shows how read services are performed via the acyclical MOVILINK parameter channel.

Control (master)	**MOVIDRIVE® (slave)**
1. Initiate the service coded in the parameter channel by means of a WRITE to the 'MOVILINK® parameter channel cyclical' object.	
WRITE 8298 (parameter channel) →	
	OK ←
2. READ 'MOVILINK parameter channel cyclical' and evaluation of the service confirmation in the parameter channel.	
READ 8298 (parameter channel) →	
	Data = Parameter channel with result ←

1. Reception is confirmed immediately, the parameter channel is evaluated and the requested service performed.
2. Service confirmation is entered in the parameter channel and can be evaluated by READ access in the master.

The acyclical MOVILINK® parameter channel is only handled locally on the INTERBUS interface and is defined as in the following table.

Index:	8299
Object code:	7 (simple variable)
Data type index:	10 (octet string)
Length:	8
Local address:	
Password:	
Access groups:	
Access rights:	Read all/Write all
Name[16]:	-
Extension length:	-

Return codes for parameterization

In the event of an incorrect parameter setting, the inverter sends back various return codes to the master which set the parameters. These codes provide detailed information about the cause of the error. All of these return codes are structured in accordance with EN 50170. The system distinguishes between the following elements:

- Error class
- Error code
- Additional code

These return codes apply to all MOVIDRIVE communications interfaces.

Error class

The error class element classifies the type of error more precisely. In accordance with EN 50170, the system differentiates between the error classes listed in table 1.

Class (hex)	Name	Meaning
1	vfd-state	Status error of the virtual field unit
2	application-reference	Error in application program
3	definition	Definition error
4	resource	Resource error
5	service	Error when performing service
6	access	Access error
7	ov	Error in object list
8	other	Other error (see additional code)

The error class is generated by the communications software of the fieldbus interface if there is an error in communication. This does not apply to error class 8, Other error. Return codes sent from the inverter system are all in error class 8, Other error. The error can be more precisely identified using the additional code element.

Error code

The error code element provides a means for more precisely identifying the cause of the error within the error class. It is generated by the communications software of the fieldbus card in the event of an error in communication. Only error code 0 (Other error code) is defined for error class 8, Other error. In this case, detailed identification is made using the additional code.

Additional code

The additional code contains the return codes specific to SEW dealing with incorrect parameter settings of the inverter. They are sent back to the master in error class 8, Other error. Table 2 shows all possible codings for the additional code.

Add. code high (hex)	Add. code low (hex)	Meaning
00	00	No fault
00	10	Invalid parameter index
00	11	Function/parameter not implemented
00	12	Read access only
00	13	Parameter lock is active
00	14	Factory setting is active
00	15	Value for parameter too large
00	16	Value for parameter too small
00	17	Option card required for this function/parameter is missing
00	18	Error in system software
00	19	Parameter access only via RS-485 process interface on X13
00	1A	Parameter access only via RS-485 diagnostic interface
00	1B	Parameter has access protection
00	1C	Controller inhibit required
00	1D	Impermissible value for parameter
00	1E	Factory setting was activated
00	1F	Parameter was not saved in EEPROM
00	20	Parameter cannot be changed with output stage enabled

'Internal communications error' special case

The return code listed in the following table is sent back if a communications error has occurred between the INTERBUS interface and the inverter system. The PCP service transferred via the fieldbus may not have been performed and should be repeated. If this error reoccurs, it is necessary to switch off the inverter completely and then back on again so it is re-initialized.

	Code (dec)	Meaning
Error class:	6	Access
Error code:	2	Hardware fault
Add. code high:	0	-
Add. code low:	0	-

Correcting the fault

Repeat the read or write service. If this error occurs again, switch the inverter off completely and back on again. Contact the SEW Electronics Service for advice if this error occurs continuously.

Control via process data

The inverter is controlled using the process data simply by reading/writing the program addresses where the INTERBUS process data of the inverter are replicated. The following is an example for a simple STEP7 program for the Simatic S7:

```
L...W#16#0006
T...PAW...144... //Write 6hex on PO1 (control word = enable)
L...1500
T...PAW...146... //Write 1500dec on PO2 (speed setpoint = 300 rpm)
L...W#16#0000
T...PAW...148...//Write 0hex on PA3 (no function after factory setting)
```

Please refer to the Fieldbus Unit Profile manual for more information about controlling the inverter via the process data channel, in particular regarding the coding of the control and status word.

Setting parameters via the PCP interface

This chapter describes how parameters and IPOS variables can be read and written using the standardized INTERBUS PCP ‘Read' and 'Write' services. The example applies to all 4th generation (G4) INTERBUS interface modules and is explained using PHOENIX terminology.

The coding examples shown in the following chapters are shown in the same way as in the 'Peripherals Communication Protocol (PCP)' INTERBUS user manual produced by Phoenix Contact.

Prerequisite

You should have the following user manuals:

- 'Peripherals Communication Protocol (PCP)' INTERBUS user manual, PHOENIX CONTACT, IBS SYS PCP G4 UM
- MOVIDRIVE® Fieldbus Unit Profile manual

Presentation of coding examples

The coding examples shown in the following chapters are shown in the same way as in the 'Peripherals Communication Protocol (PCP)' INTERBUS user manual produced by Phoenix Contact.

All information in a PCP service is presented word-by-word in column format. As a result, you can think of a word as a PLC word (e.g. Simatic data word). There is a coding example for the MOVIDRIVE® inverter on the right-hand side in each case.

The communication reference (CR) is used for selecting the inverter for which the parameters should be set. In the examples below, CR = 02 hex was assigned to the inverter in the CMD Tool. The index defines the drive parameter which should be accessed.

Station description of the inverter in the CMD Tool

Before you can use the PCP channel of the inverter, you have to configure the station description in the CMD Tool for the inverter.

Process of a parameterization sequence

The peripherals communication protocol (PCP) of the INTERBUS standardizes access to the parameter data of INTERBUS stations and prescribes the following procedure:

- Initialization of the PCP connection with the 'Initiate' service
- Reading or writing with the 'Read' and 'Write' services.
- The communications link can be broken off with the 'Abort' service if it is no longer required (this is not explained here because there is often no need for it, see the PCP manual).
- Initialization of the PCP connection with the 'Initiate' service

The drive parameters of the inverter are not accessed until the PCP connection has been established with 'Initate_Request,' e.g. once during the system startup.

Word	Meaning		Coding (hex)
1	Command_Code = Initiate_Request		00 8B
2	Parameter_Count		00 02
3	-	Comm._Reference	00 02
4	Password	Access_Groups	00 00
Bits	15...8	7...0	

You should receive the positive 'Initiate_Confirmation' message after the service has been sent (see the PCP manual in case of a negative message).

Reading a drive parameter

The 'Read' service is used for reading a drive parameter (with index ≤ 8800). All the drive parameters are 4 bytes long (1 double word).

Example

Reading from P130 Ramp t11 UP CW (index 8470dec = 2116hex)

Word	Meaning		Coding (hex)
1	Command_Code = Read_Request		00 81
2	Parameter_Count		00 03
3	Invoke_ID	Comm._Reference	00 02
4	Index		21 16
5	Subindex	-	00 00
Bits	15...8	7...0	

You should receive the positive 'Read_Confirmation' message after this service has been sent.

Word	Meaning		Coding (hex)
1	Message_Code = Read_Confirmation (+)		80 81
2	Parameter_Count		00 05
3	Invoke_ID	Comm._Reference	00 02
4	Result (+)		00 00
5	-	Length	00 04
6	Data [1]	Data [2]	00 00
7	Data [3]	Data [4]	07 D0
Bits	15...8	7...0	

The parameter data are represented as follows in Motorola format (Simatic format):

Data [1] = High byte	Data [2] = Low byte	Data [3] = High byte	Data [4] = Low byte
00 hex	00 hex	07 hex	D0 hex

00 00 07 D0 hex = 2000 dec (= 2000 ms ramp)

Refer to the appendix of the 'Fieldbus Unit Profile' manual for more information about coding the drive parameters.

Word	Meaning		Coding (hex)
1	Message_Code = Read_Confirmation		80 81
2	Parameter_Count		00 03
3	Invoke_ID	Comm._Reference	00 02
4	Error_Class	Error_Code	08 00
5	Additional_Code		00 10
Bits	15...8	7...0	

The table shows the 'Value for parameter too great' return code, by way of example.

Writing a drive parameter

The 'Write' service is used for writing a drive parameter (with index ≤ 8800). All drive parameters are 4 bytes long (1 double word).

Example

Writing the ramp time 1.65 s to P130 'Ramp t11 UP CW'

Index: 8470 dec = 2116 hex

Value: 1.65 s = 1650 ms = 1650 dec = 0000 0672 hex

The parameter data are represented as follows in Motorola format (Simatic format):

Data [1] = High byte	Data [2] = Low byte	Data [3] = High byte	Data [4] = Low byte
00 hex	00 hex	06 hex	72 hex

Refer to the appendix of the 'Fieldbus Unit Profile' manual for more information about coding the drive parameters.

Word	Meaning		Coding (hex)
1	Command_Code = Write_Request		00 82
2	Parameter_Count		00 05
3	Invoke_ID	Comm._Reference	00 02
4	Index		21 16
5	Subindex	Length	00 04
6	Data [1]	Data [2]	00 00
7	Data [3]	Data [4]	06 72
Bits	15...8	7...0	

Word	Meaning		Coding (hex)
1	Message_Code = Write_Confirmation (+)		80 82
2	Parameter_Count		00 02
3	Invoke_ID	Comm._Reference	00 02
4	Result (+)		00 00
Bits	15...8	7...0	

You should receive the positive 'Write_Confirmation' message after this service has been sent.

Word	Meaning		Coding (hex)
1	Message_Code = Write_Confirmation (-)		80 82
2	Parameter_Count		00 03
3	Invoke_ID	Comm._Reference	00 02
4	Error_Class	Error_Code	08 00
5	Additional_Code		00 15
Bits	15...8	7...0	

The table shows the 'Value for parameter too great' return code, by way of example

Writing IPOS variables / parameters via MOVILINK®

The inverters offer special parameter access via the MOVILINK® parameter channel for universal write access to all inverter data (parameters, IPOS variables, IPOS program code, etc.). The following section illustrates the mechanism by which IPOS variables can be changed via the parameter channel.

The acyclical parameter channel can be used above 8299 dec (206B hex).

Example

Writing the value 74565 of the IPOS variable H0 = Index 11000 dec (2AF8 hex)

Value to be written = 74565 dec (0001 2345 hex)

Word	Meaning		Coding (hex)
1	Command_Code = Write_Request		00 82
2	Parameter_Count		00 07
3	Invoke_ID	Comm._Reference	00 02
4	Index = MOVILINK parameter channel		20 6B
5	Subindex	Length	00 08
6	Data [1] = Management byte	Data [2] = Reserved	32 00
7	Data [3/4] = Index (e.g. IPOS variable)		2A F8
8	Data [5]	Data [6]	00 01
9	Data [7]	Data [8]	23 45
Bits	15...8	7...0	

You receive the 'Write_Confirmation' after this service is sent. Once again, you can use the return codes for evaluating a negative message.

Reading IPOS variables / parameters via MOVILINK®

The inverters offer special parameter access via the MOVILINK® parameter channel for universal read access to all inverter data (parameters, IPOS variables, IPOS program code, etc.). The following section illustrates the mechanism by which IPOS variables can be read via the parameter channel. A two-stage procedure is required:

- Writing the MOVILINK parameter channel with the 'Read IPOS variable H0' job
- Reading the MOVILINK parameter channel

The MOVILINK parameter channel (acyclical) can be used above 8299 dec (206B hex).

Example

Reading the IPOS variable H0 = Index 11000 dec (2AF8 hex)

Refer to the 'Fieldbus Unit Profile' manual for a detailed description of the MOVILINK parameter channel.

Word	Meaning		Coding (hex)
1	Command_Code = Write_Request		00 82
2	Parameter_Count		00 07
3	Invoke_ID	Comm._Reference	00 02
4	Index = MOVILINK parameter channel		20 6B
5	Subindex	Length	00 08
6	Data [1] = Management byte	Data [2] = Reserved	31 00
7	Data [3/4] = Index (e.g. IPOS variable)		2A F8
8	Data [5]	Data [6]	00 00
9	Data [7]	Data [8]	00 00
Bits	15...8	7...0	

Once the positive 'Write_Confirmation (+)' has been received, read access takes place on the MOVILINK parameter channel; this involves reading the data into the interface module which were read during the previous read job defined by 'Write_Request'.

Word	Meaning		Coding (hex)
1	Command_Code = Read_Request		00 81
2	Parameter_Count		00 03
3	Invoke_ID	Comm._Reference	00 02
4	Index = MOVILINK parameter channel		20 6B
5	Subindex	-	00 00
Bits	15...8	7...0	

You should receive the positive 'Read_Confirmation' message after this service has been sent.

Word	Meaning		Coding (hex)
1	Message_Code = Read_Confirmation (+)		80 81
2	Parameter_Count		00 07
3	Invoke_ID	Comm._Reference	00 02
4	Result (+)		00 00
5	-	Length	00 08
6	Data [1] = Management byte	Data [2] = Reserved	31 00
7	Data [3/4] = Index (e.g. IPOS variable)		2A F8
8	Data [5]	Data [6]	00 01
9	Data [7]	Data [8]	23 45
Bits	15...8	7...0	

Word	Meaning		Coding (hex)
1	Message_Code = Read_Confirmation		80 81
2	Parameter_Count		00 03
3	Invoke_ID	Comm._Reference	00 02
4	Error_Class	Error_Code	08 00
5	Additional_Code		00 10
Bits	15...8	7...0	

You can use the return codes for evaluating a negative message.

Writing IPOS variables / parameters using the download parameter block

MOVIDRIVE® inverters let you download the parameter block to write several IPOS variables and parameters at the same time using one PCP service.

The download parameter block is always 230 bytes long. It is possible to write up to 42 drive parameters and IPOS variables in one block.

Example

Three values of the inverter are to be written with one 'Write_Request':

Parameter/variable name	Index	Value to be written
IPOS variable H0	11000 dec (2AF8 hex)	1 dec (1 hex)
IPOS variable H1	11001 dec (2AF9 hex)	-40000 dec (FFFF63C0 hex)
P130 Ramp t11 UP CW	8470 dec (2116 hex)	1500 dec (05DC hex)

You receive the 'Write_Confirmation' after this service is sent. Once again, you can use the return codes for evaluating a negative message. The individual parameters of the download parameter block in the inverter are written one after the other. This means if there is a negative 'Write_Confirmation' in the high part of the additional code, the parameter number at which the error occurred is entered.

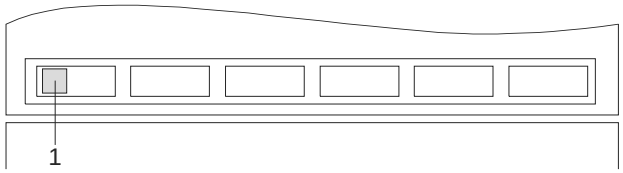
Word	Meaning		Coding (hex)
1	Command_Code = Write_Request		00 82
2	Parameter_Count = 118 words (= 76 hex)		00 76
3	Invoke_ID	Comm._Reference	00 02
4	Index = Download parameter block		20 68
5	Subindex	Length = 230 bytes (= E6 hex)	00 E6
6	Data [1] = Reserved	Data [2] = Number of parameters	00 03
7	Data [3/4] = Index of the 1st parameter (e.g. IPOS variable H0)		2A F8
8	Data [5]	Data [6]	00 00
9	Data [7]	Data [8]	00 01
10	Data [9/10] = Index of the 1st parameter (e.g. IPOS variable H1)		2A F9
11	Data [11]	Data [12]	FF FF
12	Data [13]	Data [14]	63 C0
13	Data [15/16] = Index of the 1st parameter (P130 Ramp t11)		21 16
14	Data [17]	Data [18]	00 00
15	Data [19]	Data [20]	05 DC
...	...	...	...
Bits	15...8	7...0	

You receive the 'Write_Confirmation' after this service is sent. Once again, you can use the return codes for evaluating a negative message. The individual parameters of the download parameter block in the inverter are written one after the other. This means if there is a negative 'Write_Confirmation' in the high part of the additional code, the parameter number at which the error occurred is entered.

6 Operation and Service

6.1 MCH40A operating displays (without fieldbus)

The operational status of MOVIDRIVE® *compact* MCH40A is displayed on LED V1.



05428AXX

Figure 68: MOVIDRIVE® compact MCH40A operating display

1. Operation LED V1 (three colors: green/red/yellow)

Operation LED V1

The operational states of MOVIDRIVE® *compact* MCH40A are displayed using the three-color LED V1 (green/red/yellow).

Color		Operational status	Description
-	**OFF**	No voltage	No supply voltage and no 24 V_{DC} backup voltage.
Yellow	**Steady light**	Controller inhibit or no enable	Unit ready but controller inhibit active (DIØØ = '0') or no enable.
Green	**Steady light**	Enable	Motor is energized.
Red	**Steady light**	System error leading to interlock	Error leads to unit being switched off.
Yellow	**Flashing**	Unit not ready	Factory setting in progress or 24 V_{DC} backup mode without supply voltage.
Green	**Flashing**	Flying start in progress	Operating mode VFC & FLYING START is set and inverter connected to a rotating motor.
Green/red	**Flashing 0.5 s green / 0.5 s red**	Limit switch reached	Limit switch reached in ”enable” operating status.
Yellow/ red	**Flashing 0.5 s yellow / 0.5 s red**	Limit switch reached	Limit switch reached in 'controller inhibit' operating status.
Green/red	**Flashing Green - green - red - red**	System error leading to display or wait status	Fault in 'enable' operating status which is only displayed and does not lead to a switch-off.
Yellow/ red	**Flashing Yellow - yellow - red - red**	System error leading to display or wait status	Fault in 'controller inhibit' operating status which is only displayed and does not lead to a switch-off.
Green/yel-low	**0.75 s green / 0.75 s yellow**	Timeout active	Enable ineffective, inverter is waiting for a valid message.

6.2 MCH41A operating displays (PROFIBUS-DP)

The following LEDs are on the MOVIDRIVE® *compact* MCH41A to display its operating status.

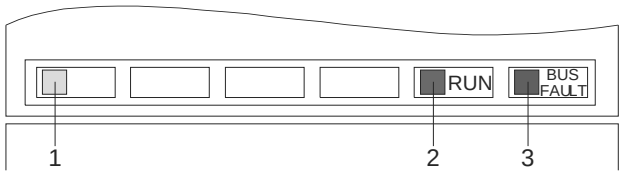


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Figure 69: MOVIDRIVE® compact MCH41A operating displays

1. Operation LED V1 (three colors: green/red/yellow)
2. PROFIBUS-DP LED 'RUN' (green)
3. PROFIBUS-DP LED 'BUS-FAULT' (red)

Operation LED V1

The operational states of MOVIDRIVE® *compact* MCH41A are displayed using the three-color LED V1 (green/red/yellow).

Color		Operational status	Description
-	**OFF**	No voltage	No supply voltage and no 24 V_{DC} backup voltage.
Yellow	**Steady light**	Controller inhibit or no enable	Unit ready but controller inhibit active (DIØØ = '0') or no enable.
Green	**Steady light**	Enable	Motor is energized.
Red	**Steady light**	System error leading to interlock	Error leads to unit being switched off.
Yellow	**Flashing**	Unit not ready	Factory setting in progress or 24 V_{DC} backup mode without supply voltage.
Green	**Flashing**	Flying start in progress	Operating mode VFC & FLYING START is set and inverter connected to a rotating motor.
Green/ red	**Flashing 0.5 s green / 0.5 s red**	Limit switch reached	Limit switch reached in ”enable” operating status.
Yellow/ red	**Flashing 0.5 s yellow / 0.5 s red**	Limit switch reached	Limit switch reached in 'controller inhibit' operating status.
Green/ red	**Flashing Green - green - red - red**	System error leading to display or wait status	Fault in 'enable' operating status which is only displayed and does not lead to a switch-off.
Yellow/ red	**Flashing Yellow - yellow - red - red**	System error leading to display or wait status	Fault in 'controller inhibit' operating status which is only displayed and does not lead to a switch-off.
Green/ yellow	**0.75 s green / 0.75 s yellow**	Timeout active	Enable ineffective, inverter is waiting for a valid message.

PROFIBUS-DP LEDs

The 'RUN' LED (green) indicates that the bus electronics are operating correctly. The 'BUS FAULT' LED (red) indicates a PROFIBUS-DP fault.

RUN	BUS FAULT	Meaning
ON	**ON**	Connection to the DP master has failed, check the bus connection. Unit does not detect a baud rate, check the setting in the DP master. Bus interruption or DP master not functioning.
ON	**OFF**	Unit is currently exchanging data with the DP master (data exchange).
ON	**FLASHING**	Unit has detected the baud rate, however it is not being addressed by the DP master. Make sure the address set on the unit (P092) matches the address set in the project planning software of the DP master. Unit was not configured in DP master or configured incorrectly. Check the configuration, use the SEW_6002.GSD GSD file.
OFF	**-**	Hardware defect in the bus electronics. Switch the unit off and on again. Contact SEW Service for advice if this reoccurs.
FLASHING	**-**	PROFIBUS address is set higher than 125. Set address ≤ 125.

6.3 MCH42A operating displays (INTERBUS FO)

The following LEDs are on the MOVIDRIVE® *compact* MCH42A to display its operating status.

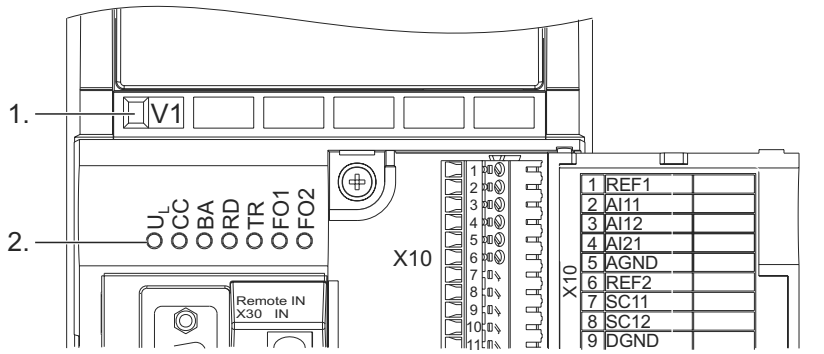

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Figure 70: MOVIDRIVE® compact MCH42A operating displays

1. Operation LED V1 (three colors: green/red/yellow)
2. INTERBUS FO LEDs

Operation LED V1

The operational states of MOVIDRIVE® *compact* MCH42A are displayed using the three-color LED V1 (green/red/yellow).

Color		Operational status	Description
-	**OFF**	No voltage	No supply voltage and no 24 V_{DC} backup voltage.
Yellow	**Steady light**	Controller inhibit or no enable	Unit ready but controller inhibit active (DIØØ = '0') or no enable.
Green	**Steady light**	Enable	Motor is energized.
Red	**Steady light**	System error leading to interlock	Error leads to unit being switched off.
Yellow	**Flashing**	Unit not ready	Factory setting in progress or 24 V_{DC} backup mode without supply voltage.
Green	**Flashing**	Flying start in progress	Operating mode VFC & FLYING START is set and inverter connected to a rotating motor.
Green/ red	**Flashing 0.5 s green / 0.5 s red**	Limit switch reached	Limit switch reached in ”enable” operating status.
Yellow/ red	**Flashing 0.5 s yellow / 0.5 s red**	Limit switch reached	Limit switch reached in 'controller inhibit' operating status.
Green/ red	**Flashing Green - green - red - red**	System error leading to display or wait status	Fault in 'enable' operating status which is only displayed and does not lead to a switch-off.
Yellow/ red	**Flashing Yellow - yellow - red - red**	System error leading to display or wait status	Fault in 'controller inhibit' operating status which is only displayed and does not lead to a switch-off.
Green/ yellow	**0.75 s green / 0.75 s yellow**	Timeout active	Enable ineffective, inverter is waiting for a valid message.

INTERBUS FO LEDs

The INTERBUS FO LEDs display the current status of the fieldbus interface and the INTERBUS system:

U_L	Logic Voltage (green = OK)
CC	Cable Check (green = OK)
BA	Bus Active (green = OK)
RD	Remote Bus Disabled (red = OFF)
TR	Transmit (green = PCP active)
FO1	Fiber Optic 1 (yellow = not OK)
FO2	Fiber Optic 2 (yellow = not OK)

The following figure shows frequently occurring INTERBUS FO LED patterns. The meanings are described in detail in the tables below.

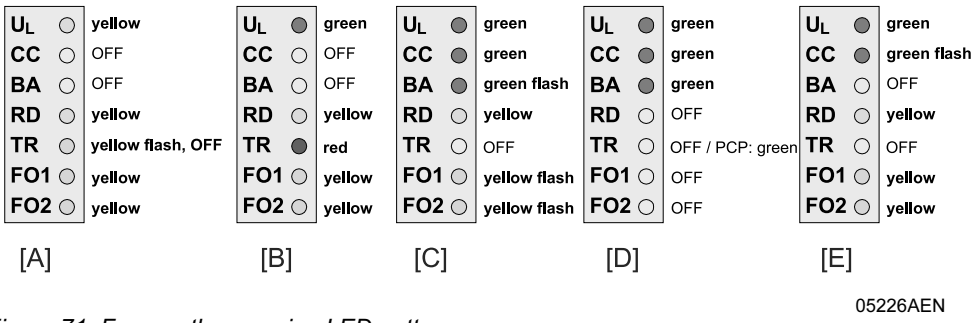


Figure 71: Frequently occurring LED patterns

[A] Inverter power-on (INTERBUS not yet active)

[B] Incorrect DIP switch setting (INTERBUS not yet active)

[C] Initialization phase of the INTERBUS system

[D] Correct INTERBUS operation

[E] Incorrectly set baud rate

LED U_L 'U Logic' (green)

Status	Meaning	Fault rectification
On	Supply voltage applied to bus ECU	-
Off	No supply voltage for bus ECU	Check that the terminal unit is correctly seated and the 24 V_{DC} voltage supply for the inverter is present.

LED CC 'Cable Check' (green)

Status	Meaning	Fault rectification
On	Incoming remote bus connection OK	-
Off	Incoming remote bus connection not OK	Check the incoming remote bus fiber optic cable and LED FO1.

LED BA 'Bus Active' (green)

Status	Meaning	Fault rectification
On	Data transfer active on INTERBUS	-
Off	No data transfer; INTERBUS stopped	Check the incoming remote bus cable. Use the diagnostic display of the INTERBUS interface module (master) for further fault localization.

LED RD 'Remote Bus Disable' (yellow)

Status	Meaning	Fault rectification
On	Outgoing remote bus switched off	-
Off	Outgoing remote bus not switched off	-

LED FO1 'Fiber Optic 1' (yellow)

Status	Meaning	Fault rectification
On	Monitoring of the incoming fiber optic cable section. If the previous station • has an optical section diagnostic function, then the power is below the system reserve level for optical transmission • does not have an optical section diagnostic function, then the optical transmission power cannot be controlled	Check the incoming FO cable for cable quality, correct plug mounting, bending radii, etc. Use the optical diagnostic function of CMD Tool or an FO measuring instrument to localize the fault further.
Off	Incoming fiber optic section OK	-

LED FO2 'Fiber Optic 2' (yellow)

Status	Meaning	Fault rectification
On	Monitoring of the outgoing fiber optic cable section. If the next station • has an optical section diagnostic function, then the power is below the system reserve level for optical transmission • does not have an optical section diagnostic function, then the optical transmission power cannot be controlled	Check the outgoing FO cable for cable quality, correct plug mounting, bending radii, etc. Use the optical diagnostic function of CMD Tool or an FO measuring instrument to localize the fault further.
Off	Outgoing fiber optic section OK	-

LED TR 'Transmit' (green)

Status	Meaning	Fault rectification
The color of the LED TR corresponds to the INTERBUS standard.		
Off	No PCP communication	-
Green	PCP communication active or INTERBUS startup (parameter access via INTERBUS PCP channel)	-

LED TR 'Transmit' (yellow or red)

Status	Meaning	Fault rectification
When the LED TR is yellow or red, this indicates states within the system which do not occur as a rule during INTERBUS operation.		
Off or green	Normal mode (see table for TR = green)	-
Yellow Flashing	Inverter in initialization phase	-
Red Steady	Incorrect DIP switch configuration selected, no INTERBUS operation possible.	Check the settings of DIP switch S1. Correct the DIP switch settings if necessary and switch the unit on again.
Red flashing	Incorrect DIP switch configuration or INTERBUS interface defective, no INTERBUS operation possible.	Check the setting of DIP switches S1 to S6. Contact SEW Electronics Service if the setting is correct.

6.4 DBG11B keypad

Basic displays

CONTROL.INHIBIT CURRENT: 0 A	Display when X11:1 (DIØØ '/CONTROL.INHIBIT') = '0'.
NO ENABLE CURRENT: 0 A	Display when X11:1 (DIØØ '/CONTROL.INHIBIT') = '1' and inverter is not enabled ('ENABLE/RAPID STOP' = '0').
SPEED 942 rpm CURRENT: 2.51 A	Display when inverter enabled.
NOTE XX XXXXXXXXXXXXXXXXXX	Information message
FAULT XX XXXXXXXXXXXXXXXXXX	Fault indication

Copy function of the DBG11B

The DBG11B keypad can be used for copying parameter sets from one MOVIDRIVE® unit to other MOVIDRIVE® units. To do this, copy the parameter set onto the keypad using P807 (MD_ → DBG). Connect the keypad to another MOVIDRIVE® unit and copy the parameter set onto the MOVIDRIVE® using P806 (DBG → MD_). The keypad can be disconnected and plugged in during operation.

Not all parameters are copied with the DBG11A keypad. Use the new DBG11B keypad to ensure that all parameters are copied.

No connection between inverter and DBG11B

One of the following error messages may appear if no communication can be established with the inverter after the supply system or the 24 V_{DC} power supply is switched on and the keypad is connected.

COMMUNIC. ERROR NO SERIAL LINK	Maybe error in MOVIDRIVE® unit
ERROR WHILE COPY FLASH ERR. XX	Error in DBG11B keypad
FATAL ERROR! CODE CRC WRONG	

Try to establish the connection by disconnecting the keypad and reconnecting it. Return the unit to SEW for repair or replacement if you cannot establish the connection.

Selected via menu

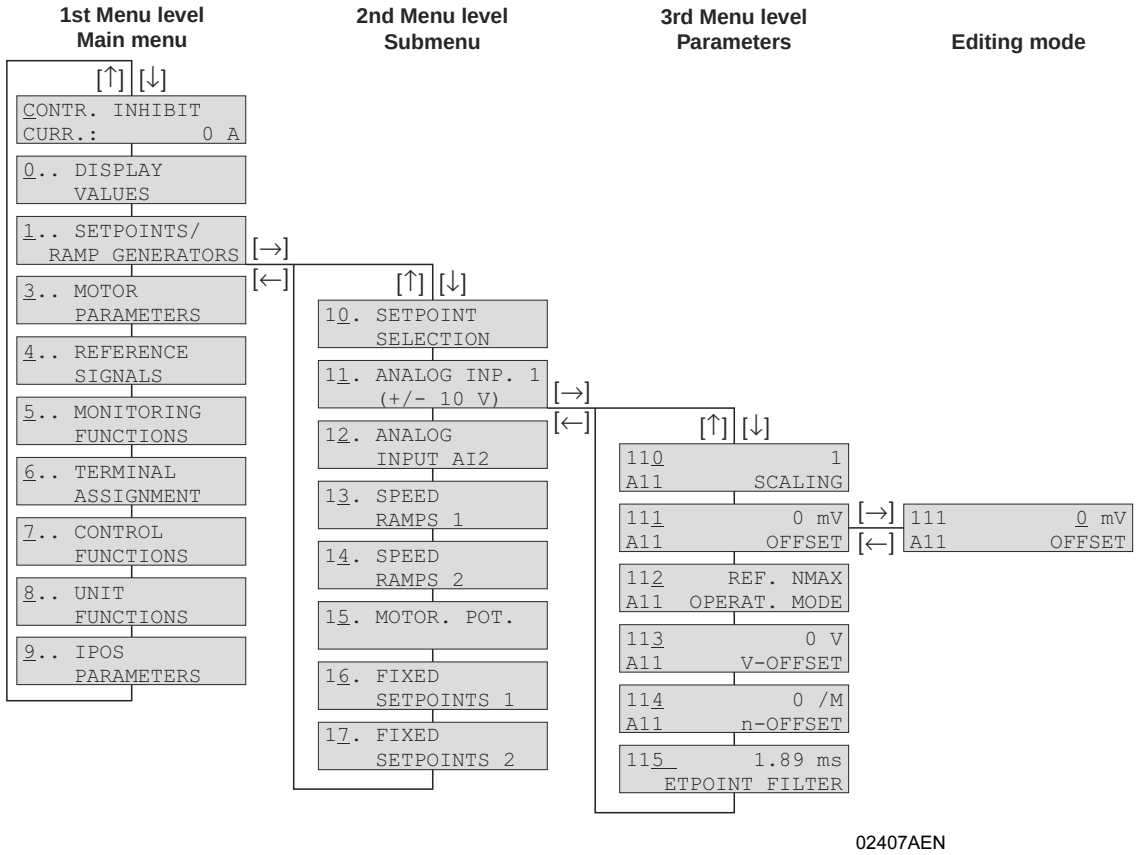
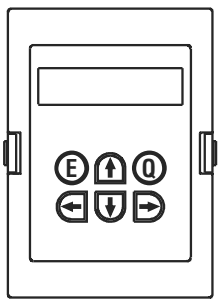


Figure 72: Menu structure



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← or → key	Change menu level, in 3rd menu level (parameter) entry to (→) or exit from (←) edit mode. The parameter can only be changed in edit mode. Startup is commenced if the ← and → keys are pressed at the same time (→ Sec. 'Startup').	
↑ or ↓ key	Select menu command, increase or decrease value in edit mode. The new value comes into effect in edit mode when the ↑ or ↓ key is released.	
Q key	Back to main display; in startup mode, cancel startup.	
E key	Startup:	Cancel startup
	Normal operation:	Signature display; the signature can only be entered or edited with MOVITOOLS/SHELL and is used for identifying the parameter set or the unit.
	Manual mode:	Exit manual mode
	Malfunction:	Call up reset parameter P840

Quick menu of the DBG11B

The DBG11B keypad has a detailed parameter menu and a clearly structured quick menu with the most frequently used parameters. It is possible to switch between both menus using P800 ('Quick menu'). This can be done in any operating status. The default setting is for the quick menu to be active. The quick menu is shown on the display by a '/' after the parameter number. The parameters in the quick menu are identified by a '/' in the parameter list.

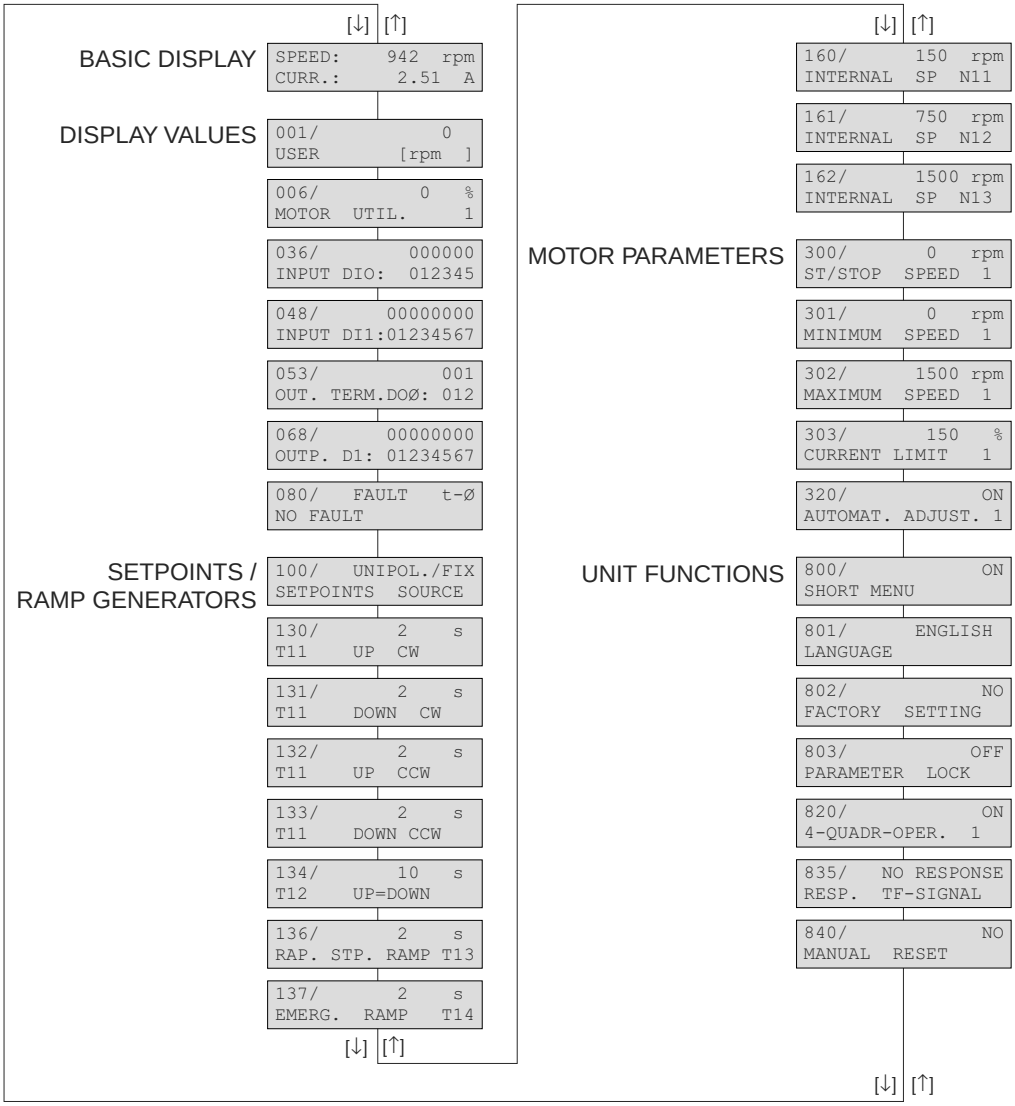

Figure 73: DBG11B quick menu

IPOS^{plus}®

MOVITOOLS is required for programming IPOS^{plus}®. The DBG11B keypad only makes it possible to edit and modify IPOS^{plus}® parameters (P9__).

The IPOS^{plus}® program is also stored in the DBG11B keypad when it is saved. It is transferred as well when the parameter set is copied to another MOVIDRIVE® unit.

Parameter P931 can be used for starting and stopping the IPOS^{plus}® program from the DBG11B keypad.

Information messages

Information messages on the DBG11B (approx. 2 s in duration) or in MOVITOOLS/SHELL (message which can be acknowledged):

No.	Text DBG11B/SHELL	Description
1	ILLEGAL INDEX	Index addressed via interface is not available.
2	NOT IMPLEMENTED	• Attempt to execute a non-implemented function. • An incorrect communication service has been selected. • Manual mode selected via impermissible interface (e.g. fieldbus).
3	READ ONLY VALUE	Attempt to edit a read only value.
4	PARAM. LOCKED	Parameter lock P803 = 'ON'. Parameter cannot be altered.
5	SETUP ACTIVE	Attempt to alter parameters during active factory setting.
6	VALUE TOO LARGE	Attempt to enter a value which is too large.
7	VALUE TOO SMALL	Attempt to enter a value which is too small.
8	REQ. PCB MISSING	The option card required for the selected function is missing.
--		
--		
11	TERMINAL ONLY	Manual mode must be completed using TERMINAL (DBG11B or USS21A).
12	NO ACCESS	Access to selected parameter refused.
13	NO CTRLER. INHIBIT	Set terminal DIØØ '/Controller inhibit' = '0' for the selected function.
14	INVALID VALUE	Attempt to enter an invalid value.
--		
16	PARAM. NOT SAVED	EEPROM buffer overrun, e.g. due to cyclical write accesses. Parameter is saved in EEPROM and is not protected against loss following POWER OFF.

6.5 Fault information

Fault memory

The fault memory (P080) stores the last five fault messages (faults t-0 t-4). The fault message of longest standing is deleted whenever more than five fault messages have occurred. The following information is stored when a malfunction takes place: Fault which occurred • Status of the binary inputs/outputs • Operational status of the inverter • Inverter status • Heat sink temperature • Speed • Output current • Active current • Unit utilization • DC link circuit voltage • ON hours • Enable hours • Parameter set • Motor utilization.

Switch-off responses

There are three switch-off responses depending on the fault; the inverter is inhibited when in fault status:

Immediate switch-off

The unit can no longer brake the drive; the output stage goes to high resistance in the event of a fault and the brake is applied immediately (DBØØ '/Brake' = '0').

Rapid stop

The drive is braked with the stop ramp t13/t23. Once the stop speed is reached (→ P300/P310), the brake is applied (DBØØ '/Brake' = '0'). The output stage goes to high-resistance after the brake reaction time has elapsed (P732 / P735).

Emergency stop

The drive is braked with the emergency ramp t14/t24. Once the stop speed is reached (→ P300/P310), the brake is applied (DBØØ '/Brake' = '0'). The output stage goes to high-resistance after the brake reaction time has elapsed (P732 / P735).

Reset

A fault message can be acknowledged by:

- Switching the supply system off and on again.

  Recommendation: Observe a minimum switch-off time of 10 s for the supply system contactor K11.
- Reset via input terminals, i.e. via an appropriately assigned binary input.
- Manual reset in SHELL (P840 = 'YES' or [Parameter] / [Manual reset]).
- Manual reset using the DBG11B (pressing the <E> key in the event of a fault gives direct access to parameter P840).

- Auto reset performs up to five unit resets with an adjustable restart time. Not to be used with drives where an automatic restart represents a risk of injury to people or damage to equipment.

Timeout active

If the inverter is controlled via a communications interface (fieldbus, RS-485 or SBus) and the power was switched off and back on again or a fault reset was performed, then the enable remains ineffective until the inverter once again receives valid data via the interface which is monitored with a timeout.

6.6 List of faults

A dot in the 'P' column means that the response is programmable (P83_ Fault response). The factory set fault response is listed in the 'Response' column.

Fault code	Name	Response	P	Possible cause	Action
00	No fault	-			
01	Over-current	Immediate switch-off		• Short circuit on output • Motor too large • Defective output stage	• Rectify the short circuit • Connect a smaller motor • Contact SEW Service for advice if the output stage is defective
03	Ground fault	Immediate switch-off		Ground fault • in the connecting harness • in the inverter • in the motor	• Eliminate ground fault • Contact SEW Service for advice
04	Brake chopper	Immediate switch-off		• Regenerative power excessive • Braking resistor circuit interrupted • Short circuit in braking resistor circuit • Excessively high braking resistance • Brake chopper defective • Possibly also ground fault	• Extend deceleration ramps • Check feeder to braking resistor • Check technical data of braking resistor • Fit a new MOVIDRIVE® if the brake chopper is defective • Check for ground fault
07	DC link overvoltage	Immediate switch-off		• DC link voltage too high • Possibly also ground fault	• Extend deceleration ramps • Check connecting harness for braking resistor • Check technical data of braking resistor • Check for ground fault
08	n-monitoring	Immediate switch-off		• Speed controller or current controller (in VFC operating mode without encoder) operating at setting limit due to mechanical overload or phase fault in the power system or motor. • Encoder not connected correctly or incorrect direction of rotation. • n_{max} is exceeded during torque control.	• Reduce load • Increase deceleration time setting (P501 or P503). • Check encoder connection, possibly swap over A/$\overline{A}$ and B/$\overline{B}$ in pairs • Check encoder voltage supply • Check current limitation • Extend ramps if appropriate • Check motor feeder and motor • Check supply system phases
09	Startup	Immediate switch-off		Inverter startup not yet performed for selected operating mode.	Perform startup for appropriate operating mode.
10	IPOS-ILLOP	Emergency stop		• Incorrect command detected during running of IPOS program. • Incorrect conditions during command execution. • Function not in inverter.	• Check program memory content and correct if necessary. • Load correct program into program memory. • Check program sequence (→ IPOS manual) • Use another function.
11	Overtemperature	Emergency stop		Thermal overload of inverter.	Reduce load and/or ensure adequate cooling.
13	Control signal source	Immediate switch-off		Control signal source not defined or defined incorrectly.	Set correct control signal source (P101).
14	Encoder	Immediate switch-off		• Encoder cable or shield not connected correctly • Short circuit/open circuit in encoder cable • Encoder defective	Check encoder cable and shield for correct connection, short circuit and open circuit.
15	24 V internal	Immediate switch-off		No internal 24 V supply voltage.	Check the mains connection. Contact SEW Service for advice if this reoccurs.
17-24	System fault	Immediate switch-off		Inverter electronics disrupted. Possibly due to effect of EMC.	Check ground connections and shields; improve them if necessary. Contact SEW Service for advice if this reoccurs.
25	EEPROM	Rapid stop		Fault when accessing EEPROM	Call up default setting, perform reset and set parameters again. Contact SEW Service for advice if this reoccurs.
26	External terminal	Emergency stop	•	Read in external fault signal via programmable input.	Eliminate specific cause of fault; reprogram terminal if appropriate.

Fault code	Name	Response	P	Possible cause	Action
27	Limit switches missing	Emergency stop		• Open circuit/both limit switches missing • Limit switches are swapped over in relation to direction of rotation of motor	• Check wiring of limit switches. • Swap over limit switch connections. • Reprogram terminals
28	Fieldbus timeout	Rapid stop	•	No master-slave communication took place within the configured response monitoring period.	• Check master communication routine • Extend fieldbus timeout time (P819) or switch off monitoring
29	Limit switch reached	Emergency stop		Limit switch was reached in IPOS operating mode.	• Check travel range. • Correct user program.
30	Emergency stop timeout	Immediate switch-off		• Drive overloaded • Emergency stop ramp too short.	• Check project planning • Extend emergency stop ramp
31	TF sensor	No response	•	• Motor too hot, TF sensor has tripped • TF sensor of motor not connected or not connected properly • MOVIDRIVE® connection and TF connection on motor interrupted	• Let motor cool down and reset fault • Check connections/link between MOVIDRIVE® and TF. • Set P835 to 'NO RESPONSE'.
32	IPOS index overrun	Emergency stop		Basic programming rules violated causing stack overflow in system.	Check IPOS user program and correct if necessary (→ IPOS manual).
33	Setpoint source	Immediate switch-off		Setpoint source not defined or defined incorrectly	Set correct setpoint source (P100).
35	Operating mode	Immediate switch-off		Operating mode not defined or defined incorrectly	Use P700 or P701 to set correct operating mode
37	System watchdog	Immediate switch-off		Fault in system software procedure	Contact SEW Service for advice.
38	System software	Immediate switch-off		System fault	Contact SEW Service for advice.
39	Reference travel	Immediate switch-off		• Reference cam missing or does not switch • Limit switches not connected correctly • Reference travel type changed during reference travel	• Check reference cam • Check connection of limit switches • Check reference travel type setting and the parameters required for it
42	Lag error	Immediate switch-off	•	• Incremental encoder connected incorrectly • Accelerating ramps too short • P-component of positioning controller too small • Speed controller parameters set incorrectly • Value of lag error tolerance too small	• Check rotary encoder connection • Extend ramps • Set P-component to higher value • Set speed controller parameters again • Increase lag error tolerance • Check encoder, motor and mains phase wiring • Check mechanical components can move freely, possibly blocked up
43	RS-485 timeout	Rapid stop	•	Communication between inverter and PC interrupted	Check connection between inverter and PC. Contact SEW Service for advice if necessary.
44	Unit utilization	Immediate switch-off		Unit utilization (IxT value) exceeds 125 %	• Reduce power output • Extend ramps • Use a larger inverter if the specified points are not possible.
45	Initialization	Immediate switch-off		• No parameters set for EEPROM in power section or parameters set incorrectly. • Option pcb not in contact with backplane bus.	• Restore factory settings. Call SEW Service for advice if the fault still cannot be reset. • Insert the option pcb correctly.
47	System bus timeout	Rapid stop	•	Fault during communication via system bus.	Check system bus connection.
77	IPOS control word	No response		**Only in IPOS operating mode:** • Attempt was made to set an invalid automatic mode (via external control). • P916 = BUSRAMP set.	• Check serial connection to external control. • Check write values of external control. • Set P916 correctly.
78	IPOS SW limit switches	No response		**Only in IPOS operating mode:** Programmed target position is outside travel range delimited by software limit switches.	• Check user program • Check position of software limit switches
81	Start condition	Immediate switch-off		**Only in 'VFC hoist' operating mode:** Current during premagnetization phase could not be injected into motor at a high enough level: • Motor rated power too small in relation to inverter rated power. • Motor cable cross section too small.	• Check startup data and repeat startup procedure if necessary. • Check connection between inverter and motor. • Check cross section of motor cable and increase if necessary.

Fault code	Name	Response	P	Possible cause	Action
82	Output open	Immediate switch-off		**Only in 'VFC hoist' operating mode:** • Two or all output phases interrupted. • Motor rated power too small in relation to inverter rated power.	• Check connection between inverter and motor. • Check startup data and repeat startup procedure if necessary.
84	Motor protection	Emergency stop	•	Motor utilization too high.	• Reduce load. • Extend ramps. • Observe longer pause times.
85	Copy	Immediate switch-off		Fault when copying parameters.	Check connection between inverter and PC.
87	Technology function	Immediate switch-off		Attempt made to load the parameter set for a technology version unit with the technology function activated into a standard version unit.	Activate the factory settings (P802 = YES) and perform a reset.
88	Flying start	Immediate switch-off		**Only in 'VFC n-CTRL' operating mode:** Actual speed > 5000 rpm when inverter enabled.	Enable only at actual speed ≤ 5000 rpm.
94	EEPROM checksum	Immediate switch-off		Inverter electronics disrupted, possibly due to effect of EMC or a defect.	Send the unit in for repair.
99	IPOS ramp calculation fault	Immediate switch-off		**Only in IPOS operating mode:** Attempt made to alter ramp times and traveling velocities when the inverter is enabled, with a sine or squared positioning ramp.	Rewrite the IPOS program so that ramp times and traveling velocities can only be altered when the inverter is inhibited.

6.7 SEW electronics service

Send in for repair

Please contact the SEW electronics service if a fault cannot be rectified (→ 'Customer and spare parts service').

When contacting the SEW electronics service, please always quote the digits of your service code to enable our service personnel to assist you more effectively.

Please provide the following information if you are sending the unit in for repair:

- Serial number (→ nameplate)
- Unit designation
- Standard type or technology type
- Digits of the service code
- Brief description of the application (application, control via terminals or serial)
- Connected motor (motor type, motor voltage, ⅄ or Δ circuit)
- Nature of the fault
- Peripheral circumstances
- Your own presumption of what has happened
- Any unusual events, etc. preceding the fault

Service label

MOVIDRIVE® units have service labels attached to them; one for the power section and another for the control unit. These are located on the side next to the nameplate.

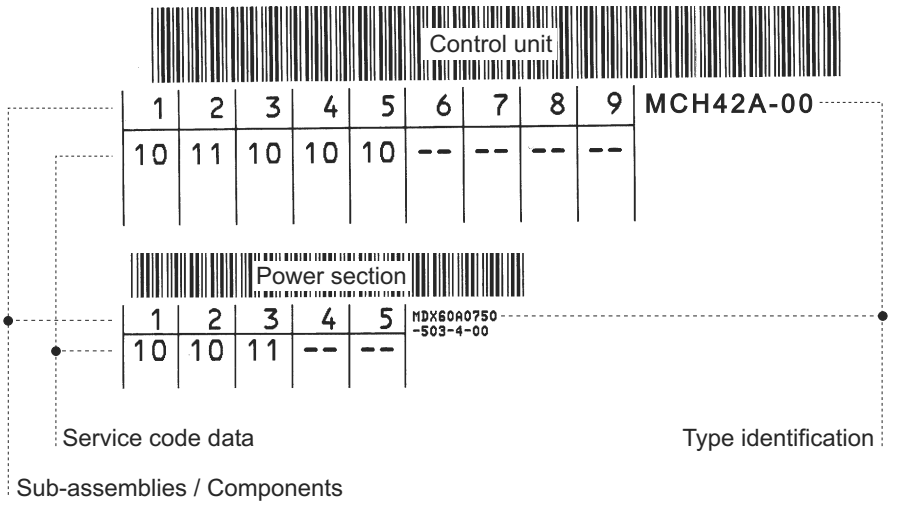
Control unit
1 2 3 4 5 6 7 8 9 MCH42A-00
10 11 10 10 10 -- -- -- --
Power section
1 2 3 4 5 MDX60A0750 -503-4-00
10 10 11 -- --
Service code data
Type identification
Sub-assemblies / Components
05227AEN

Figure 74: Service label

7 Technical Data

7.1 General technical data

The following table lists the technical data applicable to all MOVIDRIVE® *compact* drive inverters, irrespective of their type, version, size and performance.

MOVIDRIVE® *compact*	All sizes
Interference immunity	To EN 61800-3
Interference emission with EMC-compliant installation	According to class B limit to EN 55011 and EN 55014 To EN 61800-3 Sizes 1 and 2 on line side according to class A limit to EN 55011 and EN 55014 without further measures
Ambient temperature ϑ_{amb} **Derating ambient temperature** **Climate class**	0 °C...+50 °C at I_D = 100 % I_N and f_{PWM} = 4 kHz 0 °C...+40 °C at I_D = 125 % I_N and f_{PWM} = 4 kHz 0 °C...+40 °C at I_D = 100 % I_N and f_{PWM} = 8 kHz P_N reduction: 3.0 % I_N per K to max. 60 °C EN 60721-3-3, class 3K3
Storage temperature[1] ϑ_L	-25 °C...+70 °C (EN 60721-3-3, class 3K3) DBG keypad: -20 °C...+60 °C
Type of cooling (DIN 51751)	Forced cooling Temperature-controlled fan, response threshold at ϑ = 45 °C
Enclosure **Sizes 1 to 3** **EN 60529** **Size 4 and 5** **(NEMA1)**	IP20 IP00 (power connections); IP10 with Plexiglas cover mounted (supplied as standard)
Operating mode	DB (EN 60149-1-1 and 1-3)
Installation altitude	h ≤ 1000 m (3300 ft) I_N reduction: 1 % per 100 m (330 ft) from 1000 m (3300 ft) to max. 2000 m (6600 ft)

1) Connect to supply voltage for min. 5 minutes every 2 years if stored for long periods, otherwise the unit service life may be reduced.

7.2 MOVIDRIVE® compact MCH4_A...-5_3 (400/500 V units)

Size 1 (400/500 V units)

MOVIDRIVE® *compact*		0015-5A3-4-0_	0022-5A3-4-0_	0030-5A3-4-0_	0040-5A3-4-0_
INPUT					
Supply voltage	V_{mains}	3 × 380 V_{AC} -10 %...3 × 500 V_{AC} +10 %			
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %			
Rated system current[1] I_{mains} (at V_{mains} = 3 × 400 V_{AC})	**100 %** **125 %**	3.6 A_{AC} 4.5 A_{AC}	5.0 A_{AC} 6.2 A_{AC}	6.3 A_{AC} 7.9 A_{AC}	8.6 A_{AC} 10.7 A_{AC}
OUTPUT					
Rated output power[2] (at V_{mains} = 3 × 400...500 V_{AC})	P_N	2.8 kVA	3.8 kVA	4.9 kVA	6.6 kVA
Rated output current[1] (at V_{mains} = 3 × 400 V_{AC})	I_N	4.0 A_{AC}	5.5 A_{AC}	7.0 A_{AC}	9.5 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization			
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)			
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	68 Ω			
Output voltage	V_{out}	max. V_{in}			
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)			
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range			
GENERAL					
Power loss at P_N P_{Vmax}		85 W	105 W	130 W	180 W
Cooling air consumption		40 m^3/h (24 ft^3/min)			
Weight		2.8 kg (6.16 lb)			
Dimensions	**W × H × D**	105 × 315 × 161 mm (4.13 × 12.40 × 6.34 in)			

1) The system and output currents must be reduced by 20 % from the nominal values for V_{mains} = 3 × 500 V_{AC}.

2) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCH4_A standard type (VFC/CFC/SERVO)	0015-5A3-4-00	0022-5A3-4-00	0030-5A3-4-00	0040-5A3-4-00
MCH40A part numbers (without fieldbus)	827 603 X	827 604 8	827 605 6	827 606 4
MCH41A part numbers (with PROFIBUS-DP)	827 649 8	827 650 1	827 651 X	827 652 8
MCH42A part numbers (with INTERBUS FO)	827 565 3	827 566 1	827 567 X	827 568 8
MCH4_A technology type (VFC/CFC/SERVO)	**0015-5A3-4-0T**	**0022-5A3-4-0T**	**0030-5A3-4-0T**	**0040-5A3-4-0T**
MCH40A part numbers (without fieldbus)	827 626 9	827 627 7	827 628 5	827 629 3
MCH41A part numbers (with PROFIBUS-DP)	827 672 2	827 673 0	827 674 9	827 675 7
MCH42A part numbers (with INTERBUS FO)	827 158 5	827 159 3	827 160 7	827 161 5
VFC operating mode **Constant load** **Recommended motor power P_{mot}**	1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	3.0 kW (4.0 HP)	4.0 kW (5.0 HP)
Variable torque load or constant load without overload **Recommended motor power P_{mot}**	2.2 kW (3.0 HP)	3.0 kW (4.0 HP)	4.0 kW (5.0 HP)	5.5 kW (7.5 HP)
CFC/SERVO operating mode (f_{PWM} = 8 kHz) **Continuous output current = 100 % I_N I_D**	4.0 A_{AC}	5.5 A_{AC}	7.0 A_{AC}	9.5 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection			

Size 2 (400/500 V units)

MOVIDRIVE® *compact*		0055-5A3-4-0_	0075-5A3-4-0_	0110-5A3-4-0_
INPUT				
Supply voltage	V_{mains}	$3 \times 380\ V_{AC}$ -10 %...$3 \times 500\ V_{AC}$ +10 %		
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %		
Rated system current[1] **(at $V_{mains} = 3 \times 400\ V_{AC}$)**	I_{mains} 100 % 125 %	11.3 A_{AC} 14.1 A_{AC}	14.4 A_{AC} 18.0 A_{AC}	21.6 A_{AC} 27.0 A_{AC}
OUTPUT				
Rated output power[2] **(at $V_{mains} = 3 \times 400...500\ V_{AC}$)**	P_N	8.7 kVA	11.2 kVA	16.8 kVA
Rated output current[1] **(at $V_{mains} = 3 \times 400\ V_{AC}$)**	I_N	12.5 A_{AC}	16 A_{AC}	24 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization		
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)		
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	47 Ω		22 Ω
Output voltage	V_{out}	max. V_{in}		
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)		
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range		
GENERAL				
Power loss at P_N	P_{Vmax}	220 W	290 W	400 W
Cooling air consumption		80 m^3/h (48 ft^3/min)		
Weight		5.9 kg (12.98 lb)		
Dimensions	**W × H × D**	130 × 335 × 213 mm (5.12 × 13.19 × 8.39 in)		

1) The system and output currents must be reduced by 20 % from the nominal values for $V_{in} = 3 \times 500\ V_{AC}$.

2) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCH4_A standard type (VFC/CFC/SERVO)	**0055-5A3-4-00**	**0075-5A3-4-00**	**0110-5A3-4-00**
MCH40A part numbers (without fieldbus)	827 607 2	827 608 0	827 609 9
MCH41A part numbers (with PROFIBUS-DP)	827 653 6	827 654 4	827 655 2
MCH42A part numbers (with INTERBUS FO)	827 569 6	827 570 X	827 571 8
MCH4_A technology type (VFC/CFC/SERVO)	**0055-5A3-4-0T**	**0075-5A3-4-0T**	**0110-5A3-4-0T**
Part numbers (without fieldbus)	827 630 7	827 631 5	827 632 3
Part numbers (with PROFIBUS-DP)	827 676 5	827 677 3	827 678 1
Part numbers (with INTERBUS FO)	827 162 3	827 163 1	827 164 X
VFC operating mode **Constant load** **Recommended motor power P_{mot}**	5.5 kW (7.5 HP)	7.5 kW (10 HP)	11 kW (15 HP)
Variable torque load or constant load without overload **Recommended motor power P_{mot}**	7.5 kW (10 HP)	11 kW (15 HP)	15 kW (20 HP)
CFC/SERVO operating mode (f_{PWM} = 8 kHz) **Continuous output current = 100 % I_N I_D**	12.5 A_{AC}	16 A_{AC}	24 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection		

Size 3 (400/500 V units)

MOVIDRIVE® *compact*		0150-503-4-0_	0220-503-4-0_	0300-503-4-0_
INPUT				
Supply voltage	V_{mains}	3 × 380 V_{AC} -10 %...3 × 500 V_{AC} +10 %		
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %		
Rated system current[1] I_{mains} 100 % (at V_{mains} = 3 × 400 V_{AC}) **125 %**		28.8 A_{AC} 36.0 A_{AC}	41.4 A_{AC} 51.7 A_{AC}	54.0 A_{AC} 67.5 A_{AC}
OUTPUT				
Rated output power[2] (at V_{mains} = 3 × 400...500 V_{AC})	P_N	22.2 kVA	31.9 kVA	41.6 kVA
Rated output current[1] (at V_{mains} = 3 × 400 V_{AC})	I_N	32 A_{AC}	46 A_{AC}	60 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization		
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)		
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	15 Ω		12 Ω
Output voltage	V_{out}	max. V_{in}		
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)		
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range		
GENERAL				
Power loss at P_N	P_{Vmax}	550 W	750 W	950 W
Cooling air consumption		180 m^3/h (108 ft^3/min)		
Weight		14.3 kg (31.46 lb)		
Dimensions	**W × H × D**	200 × 465 × 233 mm (7.87 × 18.31 × 9.17 in)		

1) The system and output currents must be reduced by 20 % from the nominal values for V_{in} = 3 × 500 V_{AC}.

2) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCH4_A standard type (VFC/CFC/SERVO)	**0150-503-4-00**	**0220-503-4-00**	**0300-503-4-00**
MCH40A part numbers (without fieldbus)	827 610 2	827 611 0	827 612 9
MCH41A part numbers (with PROFIBUS-DP)	827 656 0	827 657 9	827 658 7
MCH42A part numbers (with INTERBUS FO)	827 572 6	827 573 4	827 574 2
MCH4_A technology type (VFC/CFC/SERVO)	**0150-503-4-0T**	**0220-503-4-0T**	**0300-503-4-0T**
MCH40A part numbers (without fieldbus)	827 633 1	827 634 X	827 635 8
MCH41A part numbers (with PROFIBUS-DP)	827 679 X	827 680 3	827 681 1
MCH42A part numbers (with INTERBUS FO)	827 165 8	827 166 6	827 167 4
VFC operating mode **Constant load** **Recommended motor power P_{mot}**	15 kW (20 HP)	22 kW (30 HP)	30 kW (40 HP)
Variable torque load or constant load without overload **Recommended motor power P_{mot}**	22 kW (30 HP)	30 kW (40 HP)	37 kW (50 HP)
CFC/SERVO operating mode (f_{PWM} = 8 kHz) **Continuous output current = 100 % I_N I_D**	32 A_{AC}	46 A_{AC}	60 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection		

Size 4 (400/500 V units)

MOVIDRIVE® *compact*		0370-503-4-0_	0450-503-4-0_
INPUT			
Supply voltage	V_{mains}	3 × 380 V_{AC} -10 %...3 × 500 V_{AC} +10 %	
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %	
Rated system current[1] I_{mains} 100 % (at V_{mains} = 3 × 400 V_{AC}) **125 %**		65.7 A_{AC} 81.9 A_{AC}	80.1 A_{AC} 100.1 A_{AC}
OUTPUT			
Rated output power[2] (at V_{mains} = 3 × 400...500 V_{AC})	P_N	51.1 kVA	62.3 kVA
Rated output current[1] (at V_{mains} = 3 × 400 V_{AC})	I_N	73 A_{AC}	89 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization	
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)	
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	6 Ω	
Output voltage	V_{out}	max. V_{in}	
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)	
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range	
GENERAL			
Power loss at P_N	P_{Vmax}	1200 W	1450 W
Cooling air consumption		180 m^3/h (108 ft^3/min)	
Weight		26.3 kg (57.86 lb)	
Dimensions	**W × H × D**	280 × 522 × 233 mm (11.02 × 20.55 × 9.17 in)	

1) The system and output currents must be reduced by 20 % from the nominal values for V_{in} = 3 × 500 V_{AC}.

2) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCH4_A standard type (VFC/CFC/SERVO)	**0370-503-4-00**	**0450-503-4-00**
MCH40A part numbers (without fieldbus)	827 613 7	827 614 5
MCH41A part numbers (with PROFIBUS-DP)	827 659 5	827 660 9
MCH42A part numbers (with INTERBUS FO)	827 575 0	827 576 9
MCH4_A technology type (VFC/CFC/SERVO)	**0370-503-4-0T**	**0450-503-4-0T**
MCH40A part numbers (without fieldbus)	827 636 6	827 637 4
MCH41A part numbers (with PROFIBUS-DP)	827 682 X	827 683 8
MCH42A part numbers (with INTERBUS FO)	827 168 2	827 169 0
VFC operating mode **Constant load** **Recommended motor power P_{mot}**	37 kW (50 HP)	45 kW (60 HP)
Variable torque load or constant load without overload **Recommended motor power P_{mot}**	45 kW (60 HP)	55 kW (75 HP)
CFC/SERVO operating mode (f_{PWM} = 8 kHz) **Continuous output current = 100 % I_N I_D**	73 A_{AC}	89 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection	

Size 5 (400/500 V units)

MOVIDRIVE® *compact*		0550-503-4-0_	0750-503-4-0_
INPUT			
Supply voltage	V_{mains}	3 × 380 V_{AC} -10 %...3 × 500 V_{AC} +10 %	
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %	
Rated system current[1] I_{mains} (at V_{mains} = 3 × 400 V_{AC})	**100 %** **125 %**	94.5 A_{AC} 118.1 A_{AC}	117.0 A_{AC} 146.3 A_{AC}
OUTPUT			
Rated output power[2] (at V_{mains} = 3 × 400...500 V_{AC})	P_N	73.5 kVA	91.0 kVA
Rated output current[1] (at V_{mains} = 3 × 400 V_{AC})	I_N	105 A_{AC}	130 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization	
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)	
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	6 Ω	4 Ω
Output voltage	V_{out}	max. V_{in}	
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)	
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range	
GENERAL			
Power loss at P_N	P_{Vmax}	1700 W	2000 W
Cooling air consumption		360 m^3/h (216 ft^3/min)	
Weight		34.3 kg (75.46 lb)	
Dimensions	**W × H × D**	280 × 610 × 330 mm (11.02 × 24.02 × 12.99 in)	

1) The system and output currents must be reduced by 20 % from the nominal values for V_{in} = 3 × 500 V_{AC}.

2) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCH4_A standard type (VFC/CFC/SERVO)	**0550-503-4-00**	**0750-503-4-00**
MCH40A part numbers (without fieldbus)	827 615 3	827 616 1
MCH41A part numbers (with PROFIBUS-DP)	827 661 7	827 662 5
MCH42A part numbers (with INTERBUS FO)	827 577 7	827 578 5
MCH4_A technology type (VFC/CFC/SERVO)	**0550-503-4-0T**	**0750-503-4-0T**
MCH40A part numbers (without fieldbus)	827 638 2	827 639 0
MCH41A part numbers (with PROFIBUS-DP)	827 684 6	827 685 4
MCH42A part numbers (with INTERBUS FO)	827 170 4	827 171 2
VFC operating mode **Constant load** **Recommended motor power P_{mot}**	55 kW (75 HP)	75 kW (100 HP)
Variable torque load or constant load without overload **Recommended motor power P_{mot}**	75 kW (100 HP)	90 kW (120 HP)
CFC/SERVO operating mode (f_{PWM} = 8 kHz) **Continuous output current = 100 % I_N I_D**	105 A_{AC}	130 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection	

7.3 MOVIDRIVE® compact MCH4_A...-2_3 (230 V units)

Size 1 (230 V units)

MOVIDRIVE® *compact*		0015-2A3-4-0_	0022-2A3-4-0_	0037-2A3-4-0_
INPUT				
Supply voltage	V_{mains}	3×200 V_{AC} -10 %...3×240 V_{AC} +10 %		
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %		
Rated system current I_{mains} (at V_{mains} = 3 × 230 V_{AC})	**100 %** **125 %**	6.7 A_{AC} 8.4 A_{AC}	7.8 A_{AC} 9.8 A_{AC}	12.9 A_{AC} 16.1 A_{AC}
OUTPUT				
Rated output power[1] (at V_{mains} = 3 × 230...240 V_{AC})	P_N	2.7 kVA	3.4 kVA	5.8 kVA
Rated output current (at V_{mains} = 3 × 230 V_{AC})	I_N	7.3 A_{AC}	8.6 A_{AC}	14.5 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization		
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)		
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	27 Ω		
Output voltage	V_{out}	max. V_{in}		
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)		
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range		
GENERAL				
Power loss at P_N	P_{Vmax}	110 W	126 W	210 W
Cooling air consumption		40 m^3/h (24 ft^3/min)		
Weight		2.8 kg (6.16 lb)		
Dimensions	**W × H × D**	105 × 315 × 161 mm (4.13 × 12.40 × 6.34 in)		

1) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCH4_A standard type (VFC/CFC)	**0015-2A3-4-00**	**0022-2A3-4-00**	**0037-2A3-4-00**
MCH40A part numbers (without fieldbus)	827 617 X	827 618 8	827 619 6
MCH41A part numbers (with PROFIBUS-DP)	827 663 3	827 664 1	827 665 X
MCH42A part numbers (with INTERBUS FO)	827 588 2	827 589 0	827 590 4
MCH4_A technology type (VFC/CFC)	**0015-2A3-4-0T**	**0022-2A3-4-0T**	**0037-2A3-4-0T**
MCH40A part numbers (without fieldbus)	827 640 4	827 641 2	827 642 0
MCH41A part numbers (with PROFIBUS-DP)	827 686 2	827 687 0	827 688 9
MCH42A part numbers (with INTERBUS FO)	827 579 3	827 580 7	827 581 5
VFC operating mode **Constant load** **Recommended motor power P_{mot}**	1.5 kW (2.0 HP)	2.2 kW (3.0 HP)	3.7 kW (5.0 HP)
Variable torque load or constant load without overload **Recommended motor power P_{mot}**	2.2 kW (3.0 HP)	3.7 kW (5.0 HP)	5.0 kW (6.8 HP)
CFC/SERVO operating mode (f_{PWM} = 8 kHz) **Continuous output current = 100 % I_N I_D**	7.3 A_{AC}	8.6 A_{AC}	14.5 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection		

Size 2 (230 V units)

MOVIDRIVE® *compact*		0055-2A3-4-0_	0075-2A3-4-0_
INPUT			
Supply voltage	V_{mains}	3×200 V_{AC} -10 %...3×240 V_{AC} +10 %	
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %	
Rated system current I_{mains} (at $V_{mains} = 3 \times 230$ V_{AC})	**100 %** **125 %**	19.5 A_{AC} 24.4 A_{AC}	27.4 A_{AC} 34.3 A_{AC}
OUTPUT			
Output rated power[1] (at $V_{mains} = 3 \times 230...240$ V_{AC})	P_N	8.8 kVA	11.6 kVA
Output rated current (at $V_{mains} = 3 \times 230$ V_{AC})	I_N	22 A_{AC}	29 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization	
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)	
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	12 Ω	
Output voltage	V_{out}	max. V_{in}	
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)	
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range	
GENERAL			
Power loss at P_N	P_{Vmax}	300 W	380 W
Cooling air consumption		80 m^3/h (48 ft^3/min)	
Weight		5.9 kg (12.98 lb)	
Dimensions	**W × H × D**	130 × 335 × 213 mm (5.12 × 13.19 × 8.39 in)	

1) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCH4_A standard type (VFC/CFC)	**0055-2A3-4-00**	**0075-2A3-4-00**
MCH40A part numbers (without fieldbus)	827 620 X	827 621 8
MCH41A part numbers (with PROFIBUS-DP)	827 666 8	827 667 6
MCH42A part numbers (with INTERBUS FO)	827 591 2	827 592 0
MCH4_A technology type (VFC/CFC)	**0055-2A3-4-0T**	**0075-2A3-4-0T**
MCH40A part numbers (without fieldbus)	827 643 9	827 644 7
MCH41A part numbers (with PROFIBUS-DP)	827 689 7	827 690 0
MCH42A part numbers (with INTERBUS FO)	827 582 3	827 583 1
VFC operating mode **Constant load** **Recommended motor power P_{mot}**	5.5 kW (7.5 HP)	7.5 kW (10 HP)
Variable torque load or constant load without overload **Recommended motor power P_{mot}**	7.5 kW (10 HP)	11 kW (15 HP)
CFC/SERVO operating mode (f_{PWM} = 8 kHz) **Continuous output current = 100 % I_N I_D**	22 A_{AC}	29 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection	

Size 3 (230 V units)

MOVIDRIVE® *compact*		0110-203-4-0_	0150-203-4-0_
INPUT			
Supply voltage	V_{mains}	3 × 200 V_{AC} -10 %...3 × 240 V_{AC} +10 %	
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %	
Rated system current I_{mains} (at V_{mains} = 3 × 230 V_{AC})	**100 %** **125 %**	40.0 A_{AC} 50.0 A_{AC}	49.0 A_{AC} 61.0 A_{AC}
OUTPUT			
Output rated power[1] (at V_{mains} = 3 × 230...240 V_{AC})	P_N	17.1 kVA	21.5 kVA
Output rated current (at V_{mains} = 3 × 230 V_{AC})	I_N	42 A_{AC}	54 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization	
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)	
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	7.5 Ω	5.6 Ω
Output voltage	V_{out}	max. V_{in}	
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)	
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range	
GENERAL			
Power loss at P_N	P_{Vmax}	580 W	720 W
Cooling air consumption		180 m^3/h (108 ft^3/min)	
Weight		14.3 kg (31.46 lb)	
Dimensions	**W × H × D**	200 × 465 × 233 mm (7.87 × 18.31 × 9.17 in)	

1) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCH4_A standard type (VFC/CFC)	**0110-203-4-00**	**0150-203-4-00**
MCH40A part numbers (without fieldbus)	827 622 6	827 623 4
MCH41A part numbers (with PROFIBUS-DP)	827 668 4	827 669 2
MCH42A part numbers (with INTERBUS FO)	827 593 9	827 594 7
MCH4_A technology type (VFC/CFC)	**0110-203-4-0T**	**0150-203-4-0T**
MCH40A part numbers (without fieldbus)	827 645 5	827 646 3
MCH41A part numbers (with PROFIBUS-DP)	827 691 9	827 692 7
MCH42A part numbers (with INTERBUS FO)	827 584 X	827 585 8
VFC operating mode **Constant load** **Recommended motor power P_{mot}**	11 kW (15 HP)	15 kW (20 HP)
Variable torque load or constant load without overload **Recommended motor power P_{mot}**	15 kW (20 HP)	22 kW (30 HP)
CFC/SERVO operating mode (f_{PWM} = 8 kHz) **Continuous output current = 100 % I_N I_D**	42 A_{AC}	54 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection	

Size 4 (230 V units)

MOVIDRIVE® *compact*		0220-203-4-0_	0300-203-4-0_
INPUT			
Supply voltage	V_{mains}	3 × 200 V_{AC} -10 %...3 × 240 V_{AC} +10 %	
Supply frequency	f_{mains}	50 Hz...60 Hz ±5 %	
Rated system current I_{mains} (at V_{mains} = 3 × 230 V_{AC})	**100 %** **125 %**	72 A_{AC} 90 A_{AC}	86 A_{AC} 107 A_{AC}
OUTPUT			
Output rated power[1] (at V_{mains} = 3 × 230...240 V_{AC})	P_N	31.8 kVA	37.8 kVA
Output rated current (at V_{mains} = 3 × 230 V_{AC})	I_N	80 A_{AC}	95 A_{AC}
Current limitation	I_{max}	Motor and regenerative 150 % I_N, duration depending on the capacity utilization	
Internal current limitation		I_{max} = 0...150 % can be set in menu (P303 / P313)	
Minimum permitted brake resistance value (4Q operation)	R_{BWmin}	3.0 Ω	
Output voltage	V_{out}	max. V_{in}	
PWM frequency	f_{PWM}	Adjustable: 4/8/16 kHz (P860 / P861)	
Speed range / resolution	n_A / Δn_A	-5000...0...+5000 rpm / 0.2 rpm across the entire range	
GENERAL			
Power loss at P_N	P_{Vmax}	1100 W	1300 W
Cooling air consumption		180 m^3/h (108 ft^3/min)	
Weight		26.3 kg (57.86 lb)	
Dimensions	**W × H × D**	280 × 522 × 233 mm (11.02 × 20.55 × 9.17 in)	

1) The performance data apply to f_{PWM} = 4 kHz (factory setting in VFC operating modes).

MCH4_A standard type (VFC/CFC)	**0220-203-4-00**	**0300-203-4-00**
MCH40A part numbers (without fieldbus)	827 624 2	827 625 0
MCH41A part numbers (with PROFIBUS-DP)	827 670 6	827 671 4
MCH42A part numbers (with INTERBUS FO)	827 595 5	827 596 3
MCH4_A technology type (VFC/CFC)	**0220-203-4-0T**	**0300-203-4-0T**
MCH40A part numbers (without fieldbus)	827 647 1	827 648 X
MCH41A part numbers (with PROFIBUS-DP)	827 693 5	827 694 3
MCH42A part numbers (with INTERBUS FO)	827 586 6	827 587 4
VFC operating mode **Constant load** **Recommended motor power P_{mot}**	22 kW (30 HP)	30 kW (40 HP)
Variable torque load or constant load without overload **Recommended motor power P_{mot}**	30 kW (40 HP)	37 kW (50 HP)
CFC/SERVO operating mode (f_{PWM} = 8 kHz) **Continuous output current = 100 % I_N I_D**	80 A_{AC}	95 A_{AC}
Recommended motor power	→ Sec. Project Planning, CFC/SERVO motor selection	

7.4 MOVIDRIVE® compact MCH electronics data

MOVIDRIVE® *compact*	Setpoint processing and speed ramps	
MCH40A	**Version without fieldbus interface.**	
MCH41A	**Version with PROFIBUS-DP interface.**	
Protocol option Baud rate Connection system Bus termination Station address Name of the GSD file DP identity number	PROFIBUS-DP acc. to IEC 61158 Automatic detection of baud rate from 9.6 kbaud to 12 Mbaud 9-pin sub D connector, pin assignment to IEC 61158 not integrated, implement using suitable PROFIBUS plug with terminating resistors that can be switched on 0...125, can be set using DIP switch SEW_6003.GSD 6003_{hex} (24579_{dec})	
MCH42A	**Version with INTERBUS fiber optic (FO) interface.**	
Protocol option Baud rate Connection system	INTERBUS to prEN 50254 (DIN 19258) with optically controlled FO interface 500 kbaud and 2 Mbaud, changeover via DIP switch 4 F-SMA plugs (2 × remote bus input and 2 × remote bus output)	
Applies to all versions		
Voltage supply X10:1 for setpoint input X10:6	REF1: +10 V_{DC} +5 % / -0 %, I_{max} = 3 mA REF2: -10 V_{DC} +0 % / -5 %, I_{max} = 3 mA	Reference voltages for setpoint potentiometer
Setpoint input n1 X10:2/X10:3	AI11/AI12: Voltage or current input, can be set with S11 and P11_, sampling interval 1 ms	
(Differential input) Operating mode AI11/AI12 Resolution Internal resistance	Voltage input: n1 = 0...+10 V or -10 V...0...+10 V 12 bits R_i = 40 kΩ (external voltage supply) R_i = 20 kΩ (supply from REF1/REF2)	Current input: n1 = 0...20 mA or 4...20 mA 11 bits R_i = 250 Ω
Setpoint input n2 X10:4 TF/TH input	Analog input 0...10 V or optionally (→ P120) TF/TH input with response threshold at $R_{TF} \geq$ 2.9 kΩ ±10 %	
Internal setpoints	Parameter set 1: n11/n12/n13 = -5000...0...+5000 rpm Parameter set 2: n21/n22/n23 = -5000...0...+5000 rpm	
Time ranges of speed ramps at Δn = 3000 rpm	1st ramp t11/t21 Up: 0.0...2000 s Down: 0.0...2000 s 2nd ramp t12/t22 Up = down: 0.0...2000 s Stop ramp t13/t23 Down: 0...20 s Emergency ramp t14/t24 Down: 0...20 s Motorized potentiometer t3 Up: 0.2...50 s Down: 0.2...50 s	

The PROFIBUS-DP interface of the MOVIDRIVE® MCH41A unit corresponds to the state-of-the-art in PROFIBUS technology. The new, ground-breaking PROFIBUS-ASIC technology has been used for these units.

The concept of the MCH41A PROFIBUS-DP interface is the same as the MOVIDRIVE® MD_60A option 'PROFIBUS fieldbus interface type DFP21A'. As a result, both PROFIBUS interfaces can be used with the same PROFIBUS project planning.

MOVIDRIVE® *compact*		Other electronics data	
Auxiliary voltage output[1]	X11:8	VO24: V_{OUT} = 24 V_{DC}, maximum current carrying capacity I_{max} = 200 mA	
Ext. voltage supply[1]	X12:6	VI24: V_{IN} = 24 V_{DC} -15 % / +20 % (range: 19.2...30 V_{DC}) to EN 61131-2	
Binary inputs Internal resistance	X11:1...X11:6	DIØØ...DIØ5: Isolated (optocoupler), PLC-compatible (EN 61131), sampling interval 5 ms $R_i \approx 3.0$ kΩ, $I_E \approx 10$ mA	
Signal level		+13 V...+30 V = '1' = Contact closed -3 V...+5 V = '0' = Contact open	To EN 61131
Function	X11:1 X11:2...X11:6	DIØØ: With fixed assignment '/Controller inhibit' DIØ1...DIØ5: Selection option → Parameter menu P60_	
Binary outputs[1]	X12:1/X12:5	DBØØ/DOØ2: PLC compatible (EN 61131-2), response time 5 ms	
Signal level		'0' = 0 V '1' = +24 V **Important:** Do not apply external voltage!	
Function	X12:1 X12:5	DBØØ: With fixed assignment '/Brake', I_{max} = 150 mA, short-circuit proof DOØ2: Selection option → Parameter menu P62_, I_{max} = 50 mA, short-circuit proof	
Analog output	X12:5	AOØ1: → Menu P64_, resolution 8-bit, I_{max} = 20 mA (short-circuit proof)	
Relay output	X12:2/3/4	DOØ1: Load capacity of the relay contacts V_{max} = 30 V_{DC}, I_{max} = 800 mA	
Function	X12:2 X12:3 X12:4	DOØ1-C: Shared relay contact DOØ2-NO: NO contact DOØ2-NC: NC contact	Selection option → Parameter menu P62_
System bus (SBus)	X10:7/10 X10:8/11	SC11/21: SBus high SC12/22: SBus low	CAN bus to CAN specification 2.0, parts A and B, transmission technology to ISO 11898, max. 64 stations, terminating resistor (120 Ω) can be activated using DIP switches
Motor encoder input[1]	X15:	Permitted encoder types: • Hiperface encoders • sin/cos encoder 1 V_{SS} • TTL sensor Encoder power supply: +12 V, I_{max} = 180 mA	
Output encoder simulation or input external encoder[1]	X14:	Output encoder simulation: Signal level to RS-422 (5 V TTL) The number of pulses is as follows: • 1024 pulses/revolution (Hiperface encoder on X15) • as on X15: Motor encoder input (sin/cos encoder or TTL sensor on X15)	Input external encoder (max. 200 kHz): Permitted encoder types: • Hiperface encoders • sin/cos encoder 1 V_{SS} • TTL sensor Encoder power supply: +12 V, I_{max} = 180 mA
Reference terminals	X10:5 X10:9/X11:9/X12:7 X11:7	AGND: Reference potential for analog signals n1 and n2 and terminals X10:1 and X10:6 DGND: Reference potential for binary signals, system bus (SBus), encoder and resolver. DCOM: Reference potential for binary inputs X10:9...X10:14 (DIØØ...DIØ5).	
Permitted line cross section		only one core per terminal: 0.20...1.5 mm^2 (AWG 24...16) Use right-angled crimping pliers with 1.5 mm^2 (AWG16)	

1) **MCH40A (without fieldbus):** The unit provides a current of I_{max} = 400 mA for the +24 V outputs (VO24, DBØØ, DBØ2, encoder supply). If this value is insufficient, a 24 V_{DC} power supply unit must be connected to X10:24 (VI24). This external 24V_{DC} power supply must be capable of supplying a continuous power of 50 W and a peak power (1 s) of 100 W.

MCH41A (with PROFIBUS-DP) or MCH42A (with INTERBUS FO): SEW recommends always supplying these units with 24V_{DC} at terminal X10:24 (VI24). This external 24 V_{DC} power supply must be capable of supplying a continuous power of 50 W and a peak power (1 s) of 100 W.
The maximum total current which may be applied to the 24 V_{DC} outputs X10:16 (VO24), X10:21 (DBØØ) and X10:19 (DOØ2) is I_{max} = 400 mA.

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Assembly **Sales** **Service**	**Ansan-City**	SEW-EURODRIVE KOREA CO., LTD. B 601-4, Banweol Industrial Estate Unit 1048-4, Shingil-Dong Ansan 425-120	Tel. +82 (0) 3 14 92-80 51 Fax +82 (0) 3 14 92-80 56 master@sew-korea.co.kr

Luxembourg			
Assembly **Sales** **Service**	**Brüssel**	CARON-VECTOR S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. +352 (0) 10 23 13 11 Fax +352 (0) 10 2313 36 http://www.caron-vector.be info@caron-vector.be

Macedonia			
Sales	**Skopje**	SGS-Skopje / Macedonia "Teodosij Sinactaski" 66 91000 Skopje / Macedonia	Tel. +389 (0) 9 91 38 43 90 Fax +389 (0) 9 91 38 43 90 sgs@mol.com.mk

Malaysia			
Assembly **Sales** **Service**	**Johore**	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 (0) 73 54 57 07 + 73 54 94 09 Fax +60 (0) 73 5414 04 kchtan@pd.jaring.my

Netherlands			
Assembly **Sales** **Service**	**Rotterdam**	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085 NL-3004 AB Rotterdam	Tel. +31 (0) 10 44 63 700 Fax +31 (0) 10 41 55 552 http://www.vector-aandrijftechniek.nl info@vector.nu

New Zealand			
Assembly **Sales** **Service**	**Auckland**	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 (0) 9-2 74 56 27 Fax +64 (0) 9-2 74 01 65 sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 10 Settlers Crescent, Ferrymead Christchurch	Tel. +64 (0) 3-3 84 62 51 Fax +64 (0) 3-3 85 64 55 sales@sew-eurodrive.co.nz

Norway			
Assembly **Sales** **Service**	**Moss**	SEW-EURODRIVE A/S Solgaard skog 71 N-1599 Moss	Tel. +47 (0) 69 2410 20 Fax +47 (0) 69 2410 40 sew@sew-eurodrive.no

Peru			
Assembly **Sales** **Service**	**Lima**	SEW DEL PERU MOTORES REDUCTORES S.A.C. Los Calderos # 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 (0) 511 349-52 80 Fax +51 (0) 511 349-30 02 sewperu@terra.com.pe

Poland			
Sales	**Lodz**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 3/5 PL-92-519 Lodz	Tel. +48 (0) 4 26 77 10 90 Fax +48 (0) 4 26 77 10 99 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl

Portugal			
Assembly **Sales** **Service**	**Coimbra**	SEW-EURODRIVE, LDA. Apartado 15 P-3050-901 Mealhada	Tel. +351 (0) 2 31 20 96 70 Fax +351 (0) 2 31 20 36 85 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt

Romania			
Sales **Service**	**Bucuresti**	Sialco Trading SRL str. Madrid nr.4 71222 Bucuresti	Tel. +40 (0) 2 12 30 13 28 Fax +40 (0) 2 12 30 71 70 sialco@sialco.ro

Russia			
Sales	**St. Petersburg**	ZAO SEW-EURODRIVE P.O. Box 263 RUS-195220 St. Petersburg	Tel. +7 (0) 812 5 35 71 42 + 812 5 35 04 30 Fax +7 (0) 812 5 35 22 87 sew@sew-eurodrive.ru

Singapore			
Assembly **Sales** **Service**		SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 (0) 68 62 17 01 ... 17 05 Fax +65 (0) 68 61 28 27 Telex 38 659 sales@sew-eurodrive.com.sg

Slovenia			
Sales **Service**	**Celje**	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 SLO – 3000 Celje	Tel. +386 (0) 3 490 83 20 Fax +386 (0) 3 490 83 21 pakman@siol.net

South Africa			
Assembly **Sales** **Service**	**Johannesburg**	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. + 27 (0) 11 248 70 00 Fax +27 (0) 11 494 23 11 ljansen@sew.co.za
	Capetown	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442 Cape Town	Tel. +27 (0) 21 552 98 20 Fax +27 (0) 21 552 98 30 Telex 576 062 dswanepoel@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 2 Monaceo Place Pinetown Durban P.O. Box 10433, Ashwood 3605	Tel. +27 (0) 31 700 34 51 Fax +27 (0) 31 700 38 47 dtait@sew.co.za

Spain			
Assembly **Sales** **Service**	**Bilbao**	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 E-48170 Zamudio (Vizcaya)	Tel. +34 (0) 9 44 31 84 70 Fax +34 (0) 9 44 31 84 71 sew.spain@sew-eurodrive.es

Sweden			
Assembly **Sales** **Service**	**Jönköping**	SEW-EURODRIVE AB Gnejsvägen 6-8 S-55303 Jönköping Box 3100 S-55003 Jönköping	Tel. +46 (0) 36 34 42 00 Fax +46 (0) 36 34 42 80 http://www.sew-eurodrive.se info@sew-eurodrive.se

Switzerland			
Assembly **Sales** **Service**	**Basel**	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. +41 (0) 6 14 17 17 17 Fax +41 (0) 6 14 17 17 00 http://www.imhof-sew.ch info@imhof-sew.ch

Thailand			
Assembly **Sales** **Service**	**Chon Buri**	SEW-EURODRIVE (Thailand) Ltd. Bangpakong Industrial Park 2 700/456, Moo.7, Tambol Donhuaroh Muang District Chon Buri 20000	Tel. +66 (0) 38 21 40 22 Fax +66 (0) 38 21 45 31 sewthailand@sew-eurodrive.co.th

Turkey			
Assembly **Sales** **Service**	**Istanbul**	SEW-EURODRIVE Hareket Sistemleri Sirketi Bagdat Cad. Koruma Cikmazi No. 3 TR-81540 Maltepe ISTANBUL	Tel. +90 (0) 216 4 41 91 63 + 216 4 41 91 64 + 216 3 83 80 14 Fax +90 (0) 216 3 05 58 67 seweurodrive@superonline.com.tr

USA			
Production **Assembly** **Sales** **Service**	**Greenville**	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 (0) 864 4 39 75 37 Fax Sales +1 (0) 864 439-78 30 Fax Manuf. +1 (0) 864 4 39-99 48 Fax Ass. +1 (0) 864 4 39-05 66 Telex 805 550 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly **Sales** **Service**	**San Francisco**	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, California 94544-7101	Tel. +1 (0) 510 4 87-35 60 Fax +1 (0) 510 4 87-63 81 cshayward@seweurodrive.com
	Philadelphia/PA	SEW-EURODRIVE INC. Pureland Ind. Complex 200 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 (0) 856 4 67-22 77 Fax +1 (0) 856 8 45-31 79 csbridgeport@seweurodrive.com
	Dayton	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 (0) 9 37 3 35-00 36 Fax +1 (0) 9 37 4 40-37 99 cstroy@seweurodrive.com
	Dallas	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 (0) 214 3 30-48 24 Fax +1 (0) 214 3 30-47 24 csdallas@seweurodrive.com
	Additional addresses for service in the USA provided on request!		

Venezuela			
Assembly **Sales** **Service**	**Valencia**	SEW-EURODRIVE Venezuela S.A. Av. Norte Sur No. 3, Galpon 84-319 Zona Industrial Municipal Norte Valencia, Estado Carabobo	Tel. +58 (0) 241 8 32 98 04 Fax +58 (0) 241 8 38 62 75 sewventas@cantv.net sewfinanzas@cantv.net

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